THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LVII. No. 1461.] LONDON, MAY 12, 1891. [43RD YEAR. Price 6d.

WOLSTON'S Paste and Ready Mixed for Use.
Guaranteed Free from Adulteration. **TORBAY PAINTS.**
FOR GASHOLDERS, &c., &c.
The Original "Torbay Paints" is supplied during the present and many preceding years to the LONDON GASLIGHT & COKE COMPANY.
Special Quotations to Gas Companies.
TORBAY & DART PAINT Co., Ld.,
23, Gt. George St., Westminster, S.W.
Works: DARTMOUTH, DEVON.

— ESTABLISHED 1830. —
PARKER & LESTER,
Manufacturers & Contractors.
THE ONLY MAKERS OF
PATENT ANTIMONY PAINT,
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores for Gas and Water Works.
WORKS:
ORMSIDE STREET, OLD KENT ROAD, LONDON.
Ashmore, Benson, Pease, & Co., Ld.,
STOCKTON-ON-TEES,
Manufacturing Gas Engineers.
See Advertisement, p. 918.

CEMENT
EARLE'S
BEST
Portland Cement
MANUFACTURED BY
GEO. & THOS. EARLE,
HULL.
Office: 7, PIER STREET.
Works: WILMINGTON.
STOREAGE CAPACITY 10,000 Tons.
ESTABLISHED 1811—OVER THREE QUARTERS OF A CENTURY.
Telegraphic Address: "CEMENT HULL."

NORTON'S PATENT
"ABYSSINIAN" & ARTESIAN TUBE WELLS,
FOR TOWN WATER-WORKS AND OTHER SUPPLIES.
The following Town Water-Works Supplies have been obtained by this System, viz. :—Abbott's Langley, Aldershot, Alnwick, Cirencester, Hertford, Lechlade, St. Albans, Shrewsbury, Skegness, Southampton, Stony Stratford, Swansea, Wallingford, Watford, West Worthing, Wimborne, &c.
LE GRAND & SUTCLIFF,
HYDRAULIC ENGINEERS, 100, BUNHILL ROW, LONDON, E.C.

MELDRUM BROS.,
MANUFACTURERS OF THE WELL-KNOWN
SELF-CONTAINED DUST-FUEL FURNACES,
Have REMOVED from 26, HALF STREET,
TO
ATLANTIC WORKS, CITY ROAD,
MANCHESTER.
Telegrams:
"MELDRUM MANCHESTER."
National Telephone
No. 1674.

DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER & BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM

(ESTABLISHED 1765),

MANUFACTURER OF TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST IRON TANKS FOR DITTO,

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, and all kinds of GAS APPARATUS,

Wrought-Iron Roofs, Bridges, Girders, &c.,

Steam, Hot Water, and Range Boilers, Tanks, Cisterns, Boats, and all kinds of Wrought-Iron Work.

DRAWINGS, SPECIFICATIONS, AND ESTIMATES SUPPLIED ON APPLICATION.

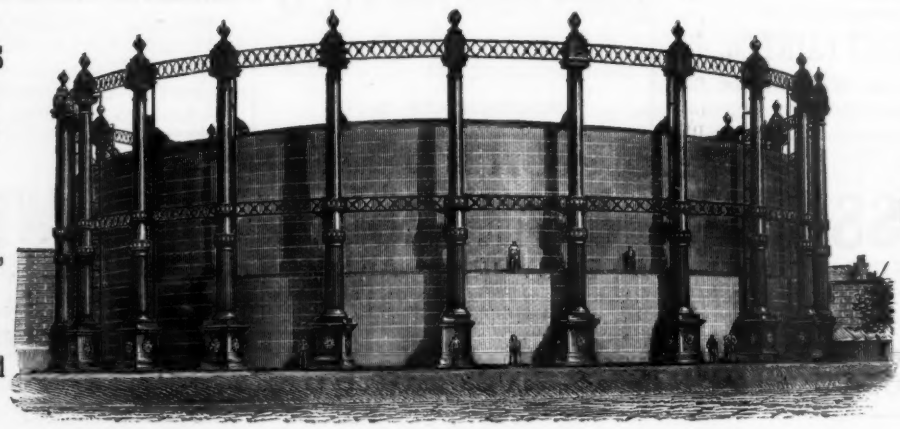
TELEGRAPHIC ADDRESS: "COCKEY'S FROME."

EDWARD COCKEY & SONS, Ld.,

ESTABLISHED OVER HALF A CENTURY.

GAS ENGINEERS, IRONFOUNDERS, & CONTRACTORS,

Manufacturers of GASHOLDERS and TANKS, BOILERS and ENGINES, ROOFS, EXHAUSTERS, BREEZE SCREENS, CHARGING and COKE BARROWS.



Manufacturers of PATENT WASHERS, PATENT VALVES for PURIFIERS, &c., GOVERNORS, LAMP COLUMNS, Weighbridges, COKE BREAKERS.

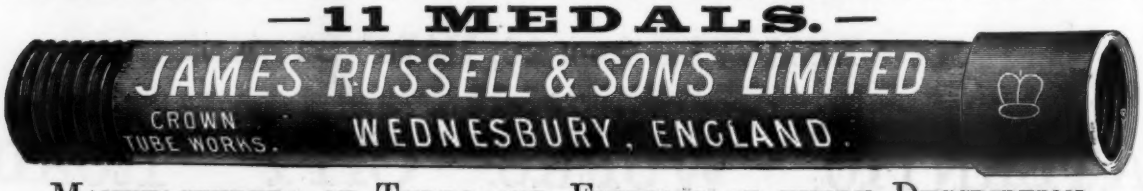
SOLE MAKERS OF COCKEY AND SMITH'S PATENT SELF-ACTING BYE-PASS VALVES.

Estimates for any description of Gas Plant on application.

THE IRON-WORKS, FROME SELWOOD, SOMERSET.

HIGHEST AWARDS—LONDON, PARIS, COLOGNE, VIENNA, MELBOURNE, AND OTHERS.

—11 MEDALS.—



MANUFACTURERS OF TUBES AND FITTINGS OF EVERY DESCRIPTION.

WROUGHT-IRON OR STEEL MAINS UP TO 6 FEET DIAMETER, FOR GAS, WATER, OIL, OR OTHER PURPOSES.

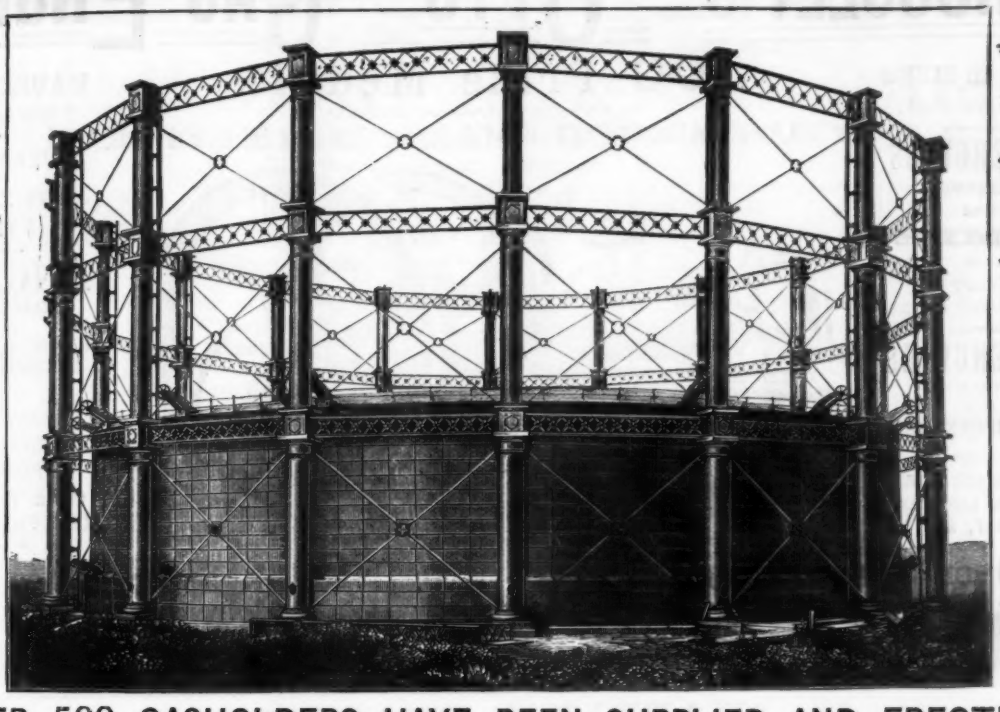
SCREWING TACKLE, BOILER MOUNTINGS, VALVES, COCKS, ETC.

LONDON: 108, Southwark Street. BIRMINGHAM: 114, Colmore Row. LEEDS: 6, Mark Lane, New Briggate.

THOMAS PIGGOTT & CO., BIRMINGHAM.

LONDON OFFICE: ST. THOMAS APOSTLE, E.C.

GAS PLANTS, BOILERS, ENGINES, PUMPS, ROOFS, RETORT FITTINGS, ETC.



TELEGRAPHIC ADDRESS: ATLAS, BIRMINGHAM.

WELDED & RIVETED FOUL PIPES, MAINS, RETORT LIDS, & CAST TANKS, PURIFIERS.

OVER 500 GASHOLDERS HAVE BEEN SUPPLIED AND ERECTED,

INCLUDING THOSE SUPPLIED TO THE FOLLOWING GAS COMPANIES AND CORPORATIONS:

BATH.	BOLTON.	BRISTOL.	CHELTENHAM.	LEAMINGTON.	PRESTON.	SHEFFIELD.
BELFAST.	BOMBAY.	BRISBANE.	HARTLEPOOL.	LIVERPOOL.	READING.	STOCKHOLM.
BECKTON.	BRADFORD.	CARDIFF.	LEEDS.	NOTTINGHAM.	RIO GRANDE.	SYDNEY.
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GAS COAL.

BEST

REAL OLD SILKSTONE GAS COAL,

Address, THE STRAFFORD COLLIERIES COMPANY,

Near BARNSLEY, SOUTH YORKSHIRE.

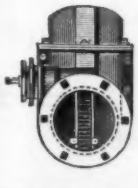
NEWTON, CHAMBERS, & CO., LIMITED

THORNCLIFFE IRON-WORKS, near SHEFFIELD,

MANUFACTURERS OF

SLIDE VALVES, WITH RACK & PINION, OR Internal or External SCREWS, of all Sizes.

GASHOLDERS, AND Gasholder Tanks.



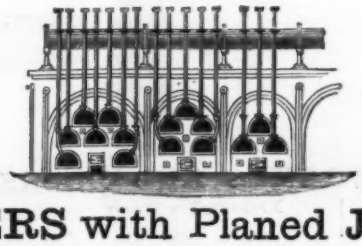
CAST-IRON RETORTS,

RETORT-BED FITTINGS,

And Retort-House Appliances

of every description.

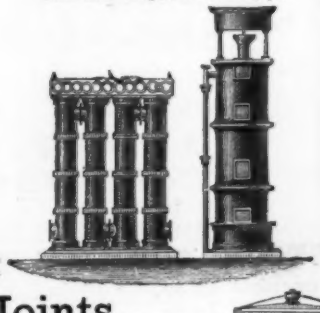
Iron Roofs, Columns, Girders, Floor Plates and Tools, &c.



WROUGHT AND CAST IRON

CONDENSERS, SCRUBBERS, & WASHERS,

TAR AND LIQUOR PUMPS, &c.



PATENT

CENTRE VALVES

for working Purifiers.

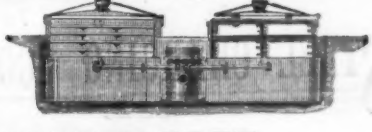
Also Bye-Pass & Stop Valves

PURIFIERS with Planed Joints,

HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS and SPECIALS,

WOOD GRIDS.

CAST AND WROUGHT IRON TANKS AND CISTERNS.



DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

CROSSLEY'S "OTTO" GAS-ENGINE.

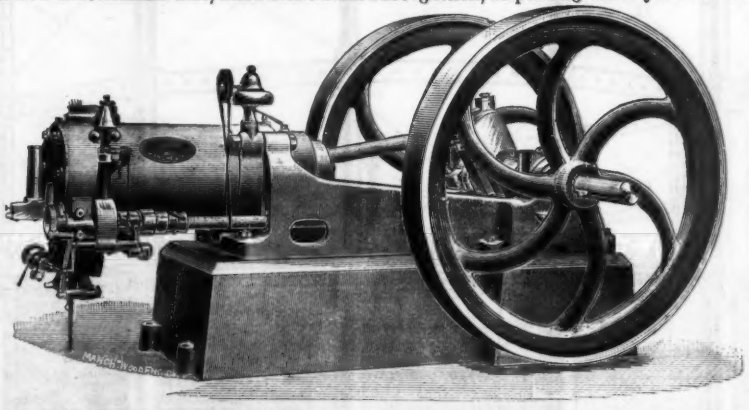
100 Prize Medals.

MADE in SIZES
2-Man to 100-HP.

GAS-ENGINES
COMBINED
WITH
PUMPS
FOR
TOWNS SUPPLY,
SEWAGE, &c., &c.

GAS-ENGINES
COMBINED
WITH
AIR COMPRESSORS
FOR THE
SHONE SEWAGE
SYSTEM, LUCIGEN
LIGHT, &c.

New 14-H.P. Nominal Size, fitted with Patent Tube Ignition, dispensing entirely with Plates.



MADE in SIZES
2-Man to 100-HP.

VERTICAL
AND
HORIZONTAL
TYPES.

ENGINES
COMBINED
WITH
HOISTS, PUMPS,
DYNAMOS, &c., &c.

Largely used for
EXHAUSTING,
PUMPING,
COKE CRUSHING,
ELECTRIC LIGHTING,
&c., &c.

Over **31,000** "OTTO" ENGINES are at work.

CROSSLEY BROS., LTD., OPENSHAW, MANCHESTER,

LONDON,
LIVERPOOL,
GLASGOW,
NEWCASTLE,
BIRMINGHAM,
HULL.

HARRIS & PEARSON,

STOURBRIDGE, ENGLAND.

MANUFACTURERS OF

FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.

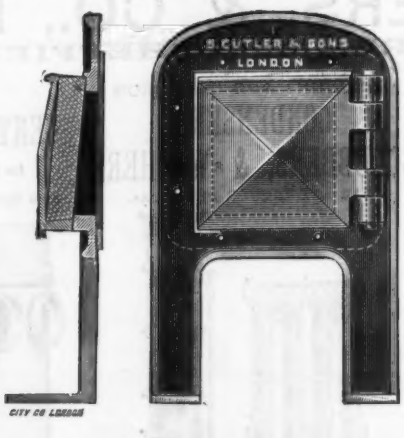
GLAZED BRICKS AND PORCELAIN BATHS.

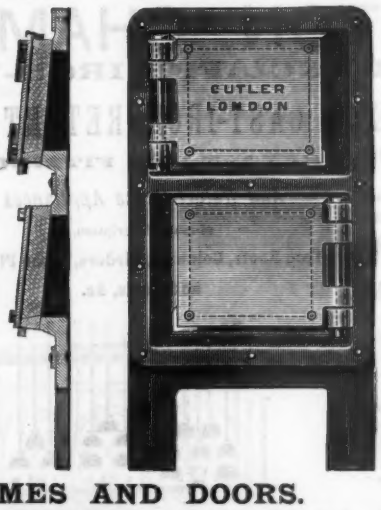
SAML. CUTLER & SONS, Engineers,

GAS AND WATER WORKS CONTRACTORS.

EVERY REQUIREMENT FOR RETORT-HOUSES.

MOUTHPIECES.
ASCENSIONS.
ARCH
DIPS.
HYDRAULIC
MAINS.
SEAL VALVES.





BUCKSTAVES.
TIE-RODS.
FURNACE
FITTINGS.
RAKES.
SHOVELS.
SCOOPS.

STOCK FURNACE FRAMES AND DOORS.

Single Door, opening 12 in. by 12 in.
do. „ 10 in. „ 10 in.

Double Door, openings 12 in. by 10 in.
do. „ 10 in. „ 10 in.

STEEL CHARGING SCOOPS.

FIG 21

IN ORDERING STATE SIZE AND LENGTH OF RETORT.

WORKS:

PROVIDENCE IRON-WORKS, MILLWALL, LONDON, E.

Telegrams: "CUTLER, MILLWALL, LONDON." *Telephone:* 5059.

OFFICES:

16, GT. GEORGE STREET, WESTMINSTER, S.W.

Telegrams: "RETORTUS, LONDON" *Telephone:* 3223.

A.B.C. CODE USED, 4TH EDITION 1883.

JOSEPH CLIFF & SONS,

INCORPORATED IN
THE LEEDS FIRE-CLAY COMPANY, Ltd.,
WORTLEY, LEEDS.

LONDON Offices & Depôts:
Baltic Wharf, Waterloo Bridge.
WHARVES NOS. 2 & 4, INSIDE G.N. GOODS YARD, KING'S CROSS, N.
LIVERPOOL:
16, Lightbody Street.
LEEDS:
Queen Street.

MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

ESTABLISHED MORE THAN A QUARTER OF A CENTURY

WORKS
HUNSLET,
LEEDS

LONDON OFFICE:
60, QUEEN VICTORIA STREET
E.C.

CLAYTON SON & CO. LTD.

MAKE A

SPECIALTY
OF
GASHOLDERS

AND
MAKERS
OF

REGT TELEGRAPHIC ADDRESS: "GAS LEEDS"

GAS PLANT OF EVERY DESCRIPTION.

JOHN BROWN & CO., LTD., SHEFFIELD,

Proprietors of
ALDWARKE MAIN CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

ALDWARKE MAIN GAS COAL

Analysis: 12,600 feet of 19-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.
Telegrams: "ATLAS SHEFFIELD."

R. & J. DEMPSTER,

GAS PLANT WORKS, NEWTON HEATH, MANCHESTER,
MAKERS AND ERECTORS OF

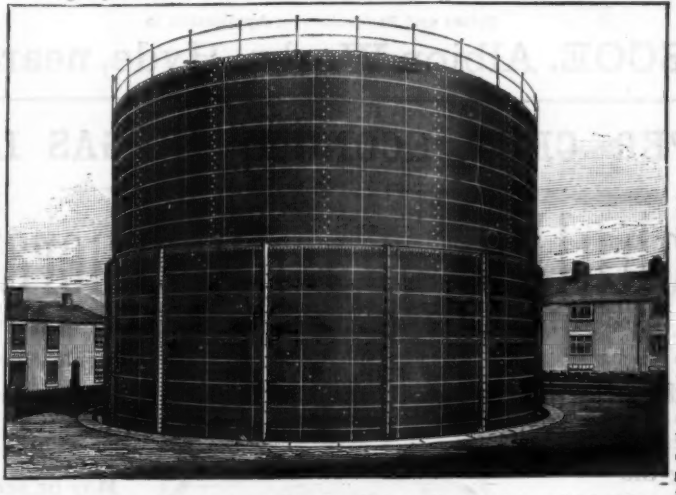
PATENT COLUMNLESS GASHOLDERS.

Telegraphic Address: "SCRUBBER MANCHESTER."

TOTAL WEIGHT REDUCED
from 30 per cent. to 50 per cent.

TRANSPORT AND ERECTION REDUCED
to the same extent; and in cases where gasholders are shipped abroad to places difficult of access, this represents a very large amount of money.

TANK CONSTRUCTION SIMPLIFIED.
The Tank wall (of whatever construction) is a regular cylinder. There are no piers needed, and all expensive foundation stones for the base of columns or standards are dispensed with.



Two-Lift Gasholder erected at the Gas-Works, Northwich, which has been in continuous work since Jan. 3, 1890, and has been subjected to most severe tests from heavy gales, with perfectly satisfactory results.

COST OF PAINTING SAVED
for the Columns and Girders.

TILTING UTTERLY IMPOSSIBLE;
And as there are fewer parts, there is less liability for the Gasholder to get out of order in working.

STABILITY UNDER WIND PRESSURE
of a Gasholder constructed upon this system is at least equal to, and from experiments and calculations made is far in excess of, that of a Holder of the same dimensions guided by the elaborate guide framing at present in use

The removal of heavy guide carriages and rollers from the top curbs considerably lowers the centre of gravity of the structure, and dispenses with the extra strength of sheeting necessary to carry these at the points where they are attached to the gasholder.

The plan adapts itself to telescoping to any reasonable extent, and enables very shallow holders or lifts to be employed with perfect stability.

FOR FURTHER PARTICULARS AND ESTIMATES, APPLY TO THE ABOVE.

JOHN HALL & CO.,

STOURBRIDGE,

MANUFACTURERS OF FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.
RETORTS CAREFULLY PACKED FOR SHIPMENT.
A STOCK OF DIFFERENT SHAPES ON HAND.

GAS AND WATER PIPES

AND

CASTINGS OF EVERY DESCRIPTION.

MANUFACTURED BY THE

CLAY CROSS COMPANY,

CHESTERFIELD.

TRADE	TELEGRAMS:	LONDON AGENTS:
C X O	"JACKSON"	BECK & Co.,
MARK.	CLAY CROSS.	130, GT. SUFFOLK ST., S.E.

SULPHATE OF AMMONIA.

By Her Majesty's Royal Letters Patent.

DR. FELDMANN'S APPARATUS

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICES APPLY TO THE

Sole Agents and Manufacturers,

GODDARD, MASSEY, & WARNER,

ENGINEERS,

NOTTINGHAM.

The Apparatus has been supplied to the following Firms–

BURT, BOULTON, & HAYWOOD, SILVERTOWN, and ELING.
CHANCE BROTHERS, OLDBURY (4 Apparatus).
RUNCORN SOAP & ALKALI CO., Limited, RUNCORN.
NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited, SHADWELL.
WM. BUTLER & CO., BRISTOL.
KEMPSON & CO., Pye Bridge.

And to the following Gas Companies and Corporations–

ILKESTON.	BURY.	CHORLEY.
WIDNES.	BRIGHOUSE.	WHITEHAVEN.
HALIFAX.	MARKET HARBRO'.	CHESTER.
ALTRINCHAM.	PRESCOT.	SOUTH SHIELDS.
DENTON.	SOWERBY BRIDGE.	LEEK.
ST. ALBANS.	LEICESTER.	IPSWICH.
DUKINFIELD.	DARWEN.	BOURNEMOUTH.
NORTHWICH.	NELSON.	SALFORD.
HUDDERSFIELD.	ORMSKIRK.	LUTON.
		HAMPTON COURT.

RUSCOE'S PATENT MACHINE

FOR DRILLING AND TAPPING WATER-MAINS AND GAS-MAINS UNDER PRESSURE.

Patent Saddle Back and Drilling Apparatus, whereby Gas and Water Mains can have 2-in., 3-in., 4-in., 5-in., and 6-in. Branches put on without loss of Water or Gas.

Sole Maker of HELPS' PATENT PIPE EXTRACTOR.

Prices and Particulars on Application to

JOHN RUSCOE, Albion Works, Hyde, near Manchester.

SIXTY PER CENT. ECONOMY IN GAS LIGHTING.

The Schülke Regenerative Lamp

FOR

DOMESTIC AND EXTERNAL LIGHTING.

The only Regenerative Lamp employing the Common Flat-Flame Burners.

Lamps giving 20-Candle power consume less than four feet of Gas per hour.

PURE WHITE & PERFECTLY STEADY LIGHT,

NOT AFFECTED BY DRAUGHTS.

Suitable for any existing fittings (Brackets or Suspending).

Can be fixed in a few minutes.

May be seen at the Offices of the

SCHÜLKE GAS-LAMP Co.

LIMITED,

20, HIGH HOLBORN,

LONDON, W.C.,

Where Price Lists and full particulars may be obtained.

KIRKHAM, HULETT, & CHANDLER, LIMITED.

[Mr. SIDNEY HERSEY, Managing Director.] ADDRESS AT FOOT. [Mr. J. CHANDLER, Engineer.]

416 Patent "Standard" Washer-Scrubbers,

Equal to a Daily Capacity of 374,700,000 Cubic Feet of Gas,

Erected and in course of construction at present date, amongst them being the following, viz.:—

(All new machines are supplied with improved wooden washing devices—"Bundles"—which can also be fitted to old Washers)

	Capacity. Cubic feet per day.
Altrincham	600,000
Adelaide	600,000
Aldershot	200,000
Allegheny, U.S.A.	1,000,000
Ashton-under-Lyne	1,250,000
Amsterdam	1,500,000
"	1,500,000
Annaberg	200,000
Arcachon	100,000
Animal Charcoal Co.	200,000
Altoona, U.S.A.	350,000
Buxton	250,000
Bradford	1,000,000
"	1,250,000
"	1,250,000
"	1,250,000
"	1,000,000
"	1,000,000
"	3,000,000
Bremen	150,000
Baltimore, U.S.A.	1,000,000
"	1,000,000
"	1,000,000
Balmain, N.S.W.	125,000
Bishops Stortford	150,000
Blackpool	400,000
Brussels	1,250,000
"	1,250,000
"	750,000
"	1,250,000
Banbury	250,000
Birmingham	5,000,000
Birkenhead	2,500,000
Blackburn	1,500,000
Bochum	600,000
Burntisland	250,000
Boston, U.S.A.	2,000,000
Brisbane	1,500,000
"	300,000
Burton-on-Trent	1,500,000
Barcelona	350,000
Barking	100,000
Baerlien & Co.	20,000
"	420,000
Bombay	700,000
Buffalo, U.S.A.	550,000
"	500,000
Brooklim, U.S.A.	300,000
Bergen	250,000
Berlin	150,000
Bournemouth	1,000,000
Bridgeport, U.S.A.	500,000
Brunswick	300,000
Beck & Co., St. Louis	100,000
Barmen Rittershausen	600,000
Bexhill	125,000
Brooklyn, U.S.A.	1,000,000
"	1,000,000
Brunner, Mond, & Co.	400,000
Cheltenham	2 000,000
Cannes	200,000
Croydon	1,500,000
Copenhagen	200,000
Clevedon	200,000
Columbus, U.S.A.	500,000
Cincinnati, U.S.A.	1,500,000
"	1,500,000
Chicago, U.S.A.	3,000,000
"	1,000,000
"	1,000,000
Chemnitz	1,000,000
Crewe	1,250,000
Colonial Gas-Works Co.	100,000
Cadiz	300,000
Charottenberg	600,000
Dudley	750,000
Driffield	100,000
Dukinfield	500,000
Dover	750,000
"	1,000,000
Deal	200,000
Derby	1,500,000
Dublin	3,600,000
Dowlais	100,000
Douai	500,000
Denton	500,000
Derby, U.S.A.	350,000
Denver, "	500,000
" "	1,000,000
Düsselldorf	750,000
"	500,000
Dumfries	250,000
Dunedin, N.Z.	400,000
Darlington	1,250,000
Detroit, U.S.A.	750,000
Edinburgh	1,500,000
"	2,000,000
Enfield	300,000
Essen	300,000
Elbing	150,000
Falmouth	150,000
Frankfort	300,000
Farnworth	400,000
Fenton	400,000
Friedenshütte	500,000
Fürth	400,000
Freiburg	200,000
Goole	250,000
Glossop	300,000
Guildford	300,000
Gloucester	1,250,000
Gera	300,000
Grafton, N.S.W.	100,000
Grieg	300,000
Georgetown, U.S.A.	250,000
Gluckauf	200,000
Heywood	600,000
Holywood	125,000
Huy	70,000
Harrow	250,000
Harrogate	250,000
Halstead	150,000
Heilbronn	200,000
Havanna, Cuba	750,000
Hastings	1,500,000
Huddersfield	300,000
"	750,000
"	1,500,000
Hof	200,000
Hampton Wick	500,000
Heckmondwike	500,000
Haverfordwest	100,000
Halifax, N.S.	350,000
Hamm	200,000
Halle	400,000
Heidelberg	300,000
Hartford, U.S.A.	1,000,000
Ilkeston	300,000
Inverness	250,000
Ilkley	200 000
Ilford	100,000
Kingston-on-Hull	400,000
Kidderminster	750,000
Kidsgrove	100,000
Königsberg	1,000,000
King's Lynn	300,000
LONDON:—	
The Gaslight and Coke Co.:—	
Beckton	1,250,000
"	1,250,000
"	1,250,000
"	1,250,000
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"	2,500,000
"	2,500,000
Silvertown	1,000,000
Bromley	2,000,000
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"	2,000,000
"	1,500,000
Shoreditch	2,500,000
LONDON—*Continued.*	
Pancras	1,500,000
"	1,500,000
Pimlico	2,000,000
Nine Elms (2)	3,000,000
Kensal Green (2)	3,000,000
South Metropolitan Co.:—	
Greenwich	3,000,000
Woolwich	400,000
Vauxhall	3,000,000
"	3,000,000
Lea Bridge	300,000
West Ham	1,500,000
"	3,000,000
Leeds	2,000,000
"	3,000,000
"	3,000,000
"	3,000,000
"	3,000,000
"	2,000,000
Leominster	150,000
Leiden	560,000
"	600,000
Liverpool	2,000,000
"	2,000,000
"	2,000,000
"	2,000,000
"	2,000,000
" (3)	3,000,000
Lincoln	1,000,000
"	600,000
Lowell, U.S.A.	1,000,000
Laclede, "	1,000,000
Louisville "	1,500,000
Long Eaton	500,000
Lille	900,000
"	450,000
"	750,000
"	250,000
"	250,000
Luckenwalde	330,000
Liegwitz	300,000
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Lawrence, "	500,000
Lynn, "	300,000
Lyons	1,500,000
Maidstone	1,000,000
Marseilles	1,500,000
"	1,500,000
Mons	500,000
Malines	250,000
Melbourne	1,500,000
"	1,500,000
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"	1,500,000
Manchester	2,500,000
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Manley, N.S.W.	100,000
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Magdeburg	3 0,000
Memphis, U.S.A.	750,000
Nottingham	1,250,000
"	2,500,000
"	2,500,000
"	2,000,000
"	1,500,000
"	2,000,000
Newport, U.S.A.	430,000
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"	1,750,000
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"	2,500,000
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"	50,000
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"	1,500,000
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"	2,000,000
"	1,000,000
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"	2,000,000
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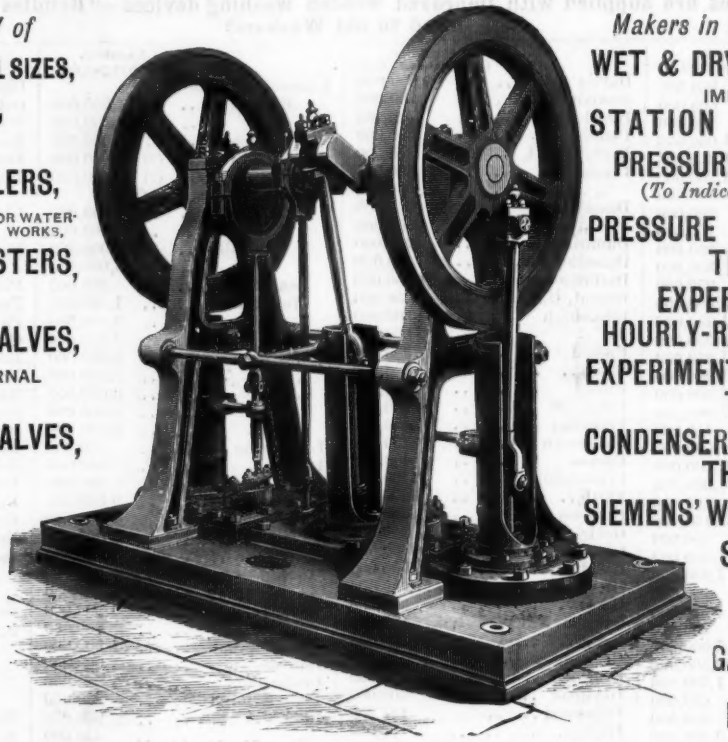

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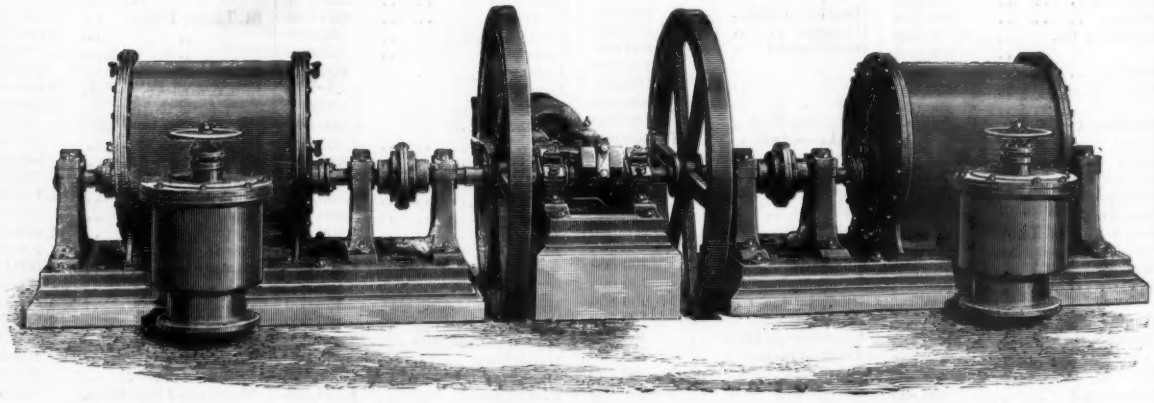

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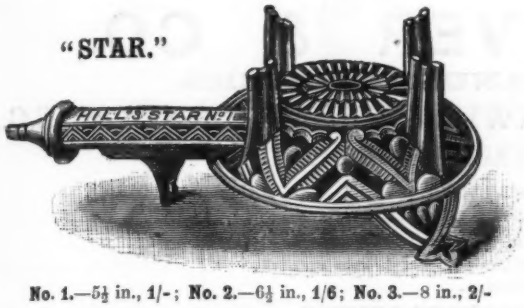

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	In.	In.	In.	In.	In.	In.							
280	11	by 10	by 16	17	by 15	by 27	1	2	2	0	0	10	0
281	12	„ 11	„ 18	18	„ 16	„ 29	2	2	15	0	0	12	0
282	13	„ 12	„ 20	19	„ 17	„ 31	2	3	10	0	0	15	0
283	14	„ 13	„ 20	21	„ 19	„ 31	3	4	5	0	0	17	6
284	15	„ 14	„ 22	23	„ 21	„ 33	4	5	5	0	1	0	0
285	16	„ 16	„ 24	24	„ 22	„ 35	5	6	10	0	1	2	6
286	18	„ 18	„ 24	26	„ 24	„ 35	5	7	10	0	1	5	0
287	20	„ 18	„ 24	28	„ 24	„ 35	6	9	0	0	1	10	0
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288	18	„ 18	„ 24	51	„ 24	„ 35	10	18	0	0	2	10	0
289	20	„ 18	„ 24	54	„ 24	„ 35	12	21	0	0	3	0	0

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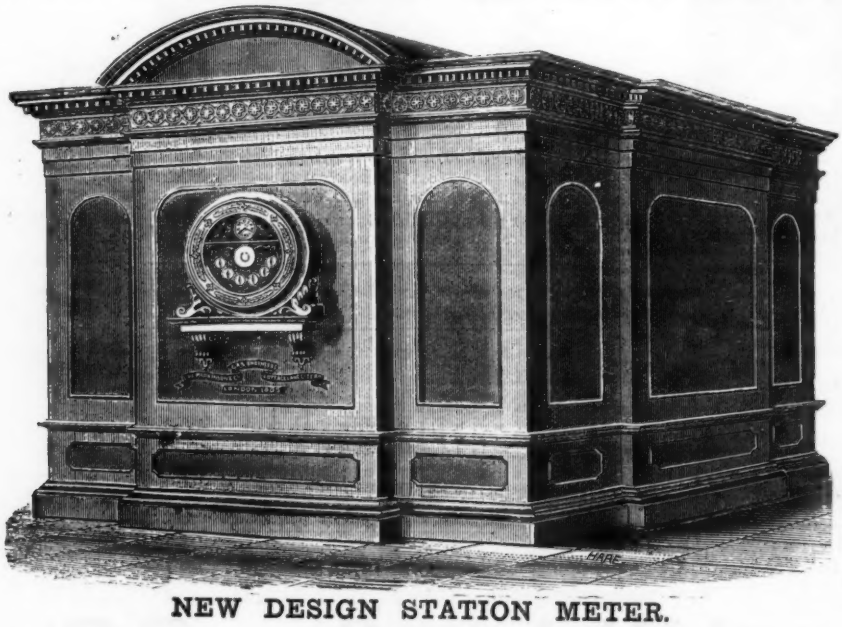

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THE
JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, MAY 12, 1891.

A Canadian Publicist upon Gas Supply.

THE Education Department for Ontario, Toronto, has issued a valuable little pamphlet by Mr. Sinclair, B.A., of the University College, Toronto, upon "Municipal "Monopolies and their Management;" being one of a series of practical essays collected under the classification of Toronto University Studies in Political Science. Local circumstances have incited the Editor of this series of Studies to devote to this particular subject the second pamphlet issued. The object of the writer is to explain in language that "the common-sense citizen" can understand, the bearings of monopolistic and competitive enterprise upon the public service in regard to the supply of such necessaries of town life as tramways, gas and water works, or electric lighting. The words "competition" and "individual enterprise" are terms to conjure with in the loosely-organized North American communities, where local self-government is not subject to the checks that operate in the United Kingdom to prevent chance majorities of half-educated local boards from playing havoc with capital sunk in irremoveable supply undertakings. The practical tradesman, or, as the Toronto University gentleman calls him, "the common-sense citizen," often finds it difficult to understand how a "monopoly" can possibly be an economical arrangement for supplying a necessary of life; and he is an easy prey for the "raiders" and "gas pirates" who go about over the North American Continent seeking openings for pushing in competing gas companies. If competition is good for trade of the ordinary kind, the shopkeeper who has been fostered in this creed, and has done so well that he can afford to spare some of his time for participating in the local government of his town, frequently cannot for the life of him see why it should not work in the matter of gas supply. The only way to persuade such a person that the obvious "common-sense" view of such a question is not the correct one, is to ply him with both argument and example. Mr. Sinclair draws upon Sir T. H. Farrer's book, "The State in "Relation to Trade," for the former; and he repeats the famous five reasons in favour of according a monopolistic status to gas and water undertakings, &c. And for the example he has only to go to Detroit, which is a typical case of the failure of the best-intentioned attempt to break through economic laws which are not less operative because obscure to the ignorant. Here, according to the evidence of the Mayor, "a franchise was granted to a "second Company to do away with the monopoly of the "first. One of the conditions of the grant was that there "should never be any combination or division of territory, "under penalty of the forfeiture of the franchise, and of a "heavy bond, which was entered into at the time of the "grant. Within two years the Companies divided territory (each taking one-half of the city), exchanged "property according to location, and immediately put the "price of gas up to the old figure before competition commenced. The city fought the case in the Courts, but "was eventually beaten; and the Companies have been "going along in their own way ever since." Having thus settled the question of monopolistic *versus* competitive gas, &c., supply, Mr. Sinclair proceeds to consider the question of commercial and municipal management. He remarks upon this head that only a moderate profit, if any, should be made by a local government assuming possession of one of its monopolies; and he goes most strongly against the indirect-taxation of gas consumers. Mr. Sinclair has been a diligent and discriminating student of the JOURNAL, and of all authoritative documents bearing upon his subject; and his essay, which is distributed free of charge by the Education Department of Ontario, should be efficacious in checking the mischief due to designing speculators operating upon uninstructed local authorities in North America, and to the propensity in the direction of indirect taxation indulged in by Corporations at home who might be expected to know better. It is a deep gratification to us to discover these occasional evidences that the facts and the principles published and upheld in the JOURNAL are instrumental in moulding well-instructed opinion all over the world in regard to the elements of good gas supply and sound municipal administration.

Gas Supply in the Salt Region.

SOME remarkable proceedings (reported elsewhere), referring to the gas supply of districts which may be disturbed, in the physical sense, by mining and pumping operations, recently took place in the Committee on the Brine Pumping Bill, the object of which is to ensure compensation for owners of property damaged by subsidence of the ground caused in the way named in the title. The Bill as submitted to the Committee contained a clause providing that owners of gas and water pipes should be entitled to recover the cost of raising or making them good, while the actual damage done to other gas-works property should be recoverable in the same way. This clause was

opposed by the representative salt workers, upon the ground that the Gas and Water Companies likely to be affected by brine pumping are able to protect themselves, particularly as in the salt districts they have obtained special powers. On the other hand, Counsel for the Gas Companies urged that the so-called special powers are only the permission to charge a higher maximum price than would have been granted for a district which was less liable to breakages and leaking from underground mains; and that, as a matter of fact, the privilege in its present shape is worthless, because gas is sold at considerably less than the maximum price. It is contended that the local Gas Companies not only have to spend their money upon lifting and repairing their pipes, but that, in addition, they lose an altogether exceptional quantity of gas by leakages which they are powerless to prevent. The Bill did not propose to compensate for waste of gas, but only for the actual cost of repairing damaged pipes and other manufacturing plant. However, at the conclusion of the argument upon the point, the Committee decided that neither Gas nor Water Companies should be entitled to compensation under the Bill. This is a strong line to take; but it is easy to follow the order of ideas that must have inspired the Committee in taking it. They would regard the supply of water or gas as a business capable of being measured by the price chargeable for the commodity. Extra leakage from mains, or risk to property in the shape of gasholders, &c., would, upon this principle, be represented by a certain addition to the working expenses. Nobody is called upon to go into the business of gas supply in the salt region; but if he does, he shall be permitted to charge a little more for his product than he would get for it in a less shaky neighbourhood. If all the cost of making good the mains, &c., were thrown upon a Compensation Board, the price of gas might possibly be brought down to what it would be anywhere else; but then the contributories to the compensation fund would have to pay the difference now chargeable to the gas consumers. The House of Commons Committee have declined to shift the burden, that is all. It is useless to discuss the question further for the present.

Manchester Waking Up.

It is with profound satisfaction that we are able to report that the Manchester City Council are showing themselves amenable to the pressure of public opinion, which is now awakening to the unsatisfactory administration of the Corporation Gas Department. One must believe that the world does move after all, when the Manchester City Council adopt, without dividing, two resolutions calling upon the Gas Committee to consider and report upon the desirability of cheapening the supply. True, these instructions only aim at the supply of gas at a low rate "for power, for heating, and for cooking purposes;" but the whole question of the politics of the Manchester Gas Administration is raised by the resolutions. Alderman Sir J. J. Harwood tried hard to stem the tide, with a defence of the policy of the Gas Committee more courageous than wise; but he must have quitted the Council Chamber last Wednesday with the conviction that the times have altered since the brave days when Alderman Lamb and himself, with the strenuous support of Sir Joseph Heron, "set the clock" for the Gas Committee. For many years we have pointed to Manchester as the leading example of what we have considered to be a vicious system of municipal gas management—that is, of the treatment of a gas undertaking as the milch-cow of a Municipality. It has seemed at times, even to ourselves, quite hopeless to keep battering away at the Manchester Corporation and their Gas Committee, seeing that local public opinion appeared to be absolutely careless of the question of gas administration. The gas consumers were utterly lethargic; putting up with anything the Gas Committee liked to do to them. And a very nice job that Committee, and the recipients of their favours, the Improvement Committee, made of it between them! It is improbable that the most ardent supporter of Manchester municipal affairs would openly profess to admire the story of the indirect taxation of the consumers of Manchester gas, and the effect of giving a spending Committee of the Corporation a heavy subsidy raised in this way without public control. Many things have happened during the past few years to shake the position of the Gas Committee. Now, at last, the local conscience has been aroused with regard to the shameful condition of the atmosphere which is breathed by a million people living in this corner of Lancashire; and the cry has been raised for cheap and clean gas to take the place of dirty coal. Alderman Sir J. J. Harwood probably holds the new-fangled "pure air" movement in huge contempt; but he would be the first to admit that, like Aldermen and some other municipal institutions, the Corporation gas undertaking exists for the good of the public. For many years he and his party have held that the best way to make the gas-works serve the public was to sell the gas at as high a price as it would fetch—that is, at what is called a "fair market price;" to make it as cheaply as possible, without being too fastidious about such trifling things as sulphur impurities; and to lay out the "profits" freely upon the improvement of the central parts of the city. It is quite within the competence of the Corporation to abandon this view in favour of another, to the effect that the public will be best served by selling gas as cheaply as possible, and by encouraging its use for every purpose which tends to private convenience and general interest. After all is said, there are higher duties for a Municipality than deluding the ratepayers with the appearances of low rating—making up the deficiency by indirect taxation through the gas bills. Does anybody think for an instant that if the inhabitants of a town were exempted from paying rates, they would be truly happy and content? The real question is, not what is the nominal rating of a town, but how it is administered. The best course the Manchester Gas Committee can follow is to institute an inquiry into the whole subject of municipal gas regulation, with particular reference to all systems actually in vogue in England and Scotland; and then the City Council will be in a position to decide whether or not they will go to the root of the matter and sell gas at cost price, adopt differential rates, or let things go on in the old style. Last Wednesday's vote, if not exactly a vote of censure upon the Gas Committee, was an expression of a desire for a change of policy; and the Committee must retort by throwing upon the Council the full responsibility for any new scheme of gas administration which is henceforward to be identified with the name of Manchester.

No More Strikes.

When it was apparent to his astounded contemporaries that Saul had joined the band of prophets, the spectacle was so surprising that it has supplied literature ever since with a picturesque figure of speech, which is vividly recalled to mind by the fact, of which we were made aware on Saturday last through the columns of a "Labour "Organ" that Mr. John Burns has at length recognized the existence in the industrial community of a "growing "dislike to the strike policy." This remarkable confession is published in the course of an article discussing the results of the Hyde Park Demonstration of Sunday week. Whatever else may be said of Mr. Burns's expressions of opinion, they are usually clear and unmistakable. It is so in this instance; for, after mentioning the disinclination to strike as "one of the new factors to be reckoned with in the "industrial evolution of the near future," the popular orator goes on to observe that "people begin to realize that striking, "although at times a necessary evil, is too heroic, and "demands from the workers too often suffering and dan-"ger incommensurate with the benefit derived;" and he proceeds to explain why this must be so by remarking that the factory system has "de-technicized and de-"individualized" the worker of to-day. It may be our alleged stupidity and prejudice on the side of Capital which inspires us with the idea, but we are distinctly of opinion that "the rapidly-growing dislike to the strike policy"—which by the way, that ex-Labour Leader, Mr. Michael Davitt, was the first to admit—is nothing more than the disgusted reaction by wage-earners from the ghastly failures of the strikes with which Mr. John Burns himself and his fellow demagogues have been identified as instigators or organizers. We take leave to assure these individuals, who are so clever at discovering some high-sounding philosophical explanation for a condition of things which is really due to their reckless incapacity, that the workers for whom they profess to speak have no more dislike on principle to strikes, provided always that these succeed, than have the demagogues who find a triumphantly organized strike a passport to Fame and Fortune. The

dock strike was not more plainly the making of Mr. Tom Mann and Mr. Ben Tillett than the riotous Leeds and Bristol performances in the same line proved the salvation of the Gas Workers' Union and its chiefs. Manchester, Silvertown, South Metropolitan gas, Spratt's factory, Scotch railways, Cardiff docks—these are the memories that sicken workmen of strikes. What about that universal strike that Mr. John Burns has tried in vain to bring about on so many occasions? It shows he has not altogether lost his head—which some of his vagaries seemed to indicate—if even at this time of day he has learnt that the strike game is for the time being "played out." Well, it was merry while it lasted, for the "delegates" who went about hobnobbing with Cardinals and Lord Mayors, and were able to look down upon Members of Parliament and call poor newspaper reporters ugly names. But first the sorrow and suffering fell heavily upon the wretched dupes; and now it begins to look as though the "leaders," like the dignitaries in Mr. W. S. Gilbert's Kingdom of Barataria, are beginning to feel that distinction without difference is hardly worth having. If the labourers will not strike at sufficiently frequent intervals to keep up the interest of the show, what are the stock company of orators and wire-pullers to do? Naturally disinclined to return to the dock and the workshop, they are all trying to make money and maintain some sort of notoriety by starting weekly newspapers, among other and more casual employments. There is a limit to this class of trade, however, as several speculators in the line have already discovered. Mr. Michael Davitt has already dropped his own venture, and goes abroad for the benefit of his health; and the others are floundering desperately after the sort of news for which the working man can be depended to pay his regular penny a week. They are getting nearer and nearer to the style of old *Reynolds's;* and when livened up by Major Somebody's "Finals," the survivors will be undistinguishable from the most shining lights of the New Journalism, with which, indeed, the New Unionism has a good deal in common besides the adjective in the title.

Recuperative Lamp Litigation.

A CASE which may have important results for the trade in recuperative gas-lamps was heard last week by Mr. Justice Vaughan Williams, sitting as an extra Judge of the Chancery Division. This was the action of the Wenham Lamp Company against the Champion Lamp Company for infringement of Mr. Frank Clark's amended patent, which is now the property of the plaintiff firm. A special report of the case for the plaintiffs will be found in another column; and that for the defence will appear next week with his Lordship's judgment. On the face of it, the presentment of the case is remarkable. Although the defendants are, by comparison, insignificant people, and the action was introduced to the Court as a "walk-over" for the plaintiffs, they were represented by all the available strength of the Bar for this particular class of practice, and had also provided themselves with the weightiest expert evidence. When the Attorney-General (Sir R. E. Webster), Mr. Aston, Q.C., Mr. Fletcher Moulton, Q.C., Sir F. J. Bramwell, F.R.S., and Dr. Hopkinson, F.R.S., are found on one side in a patent case, it presumably means either that this side wants all the strength that money can buy to disguise its inherent weakness, or that more depends upon the issue than appears on the surface. In this instance, writing before judgment has been given, we prefer to take the latter view. The Champion Gas-Lamp Company are a small firm beside the prosperous and extensive Wenham concern; but perhaps for this reason they were selected to be the subjects of a powerful exposition of the claims of the plaintiffs to the monopoly of the trade in a special order of recuperative gas-lamps. It would obviously be improper for us to criticize the evidence adduced in the case; but we are quite free to express the opinion that it is the commencement of a campaign that may be carried far, before it is closed, either with the demolition of all patent right in regard to the common order of recuperative gas-lamps, or with the erection of one patent to a position of control in the trade. The defence in this case raised the question of the validity of Clark's patent; and the legal and expert strength was employed rather to establish this patent than to rebut the attempt of the defendants to excuse themselves from the charge of infringement. The importance of the issue is obvious. During late years a very large business has been created in recuperative lamps, of which what may probably be safely described as the lion's share has been taken by the Wenham Company. They are not the only makers of such goods, however; and besides other firms with whom they might be content to work amicably, a swarm of copyists has sprung up, which, by the aid of cheap gear "made in Germany," threatens to spoil the trade for good and reliable articles. It is not to be wondered at that the Wenham Company have at length taken action to protect against this kind of piracy what they regard as their own property. How far the claim of that Company to a monopoly of the recuperative lamp manufacture will be pushed, remains to be seen. This is their business, as to which they must be allowed to exercise wide discretion without criticism. It is conceivable, however, that in matters of this kind private interest and public advantage are not identical beyond a certain limit; and then the sympathy which a spirited defence of one's own property invariably attracts is replaced by the antipathy with which a grasping policy is always regarded. It is, of course, to be understood that these are general observations, not intended to apply specifically to the particular case out of the contemplation of which they appear to arise.

Presentation to Mr. T. T. Marks, of Llandudno.—On Friday, the 1st inst., Mr. T. T. Marks, C.E., was entertained at a banquet at the Marine Hotel, Llandudno, on the occasion of his retirement from the position of Clerk and Engineer to the Improvement Commissioners of that town, which he had held for nearly fifteen years, in order to commence private practice. The chair was occupied by Dr. K. H. Bold Williams; and there was a large gathering of the representative men of the district. After the banquet, an address, setting forth the various works for the improvement of the town which had been carried out by Mr. Marks while in the service of the Local Authority—including the acquisition of the gas and water undertakings—was read. With regard to the former, it was stated that it had proved a substantial source of revenue to the town; the quantity of gas manufactured having risen from 12 to 31 million cubic feet per annum, while the price had been reduced from 6s. 6d. to 4s. 3d. per 1000 feet for lighting, and to 3s. per 1000 feet for domestic and manufacturing purposes. As to the water-works, they were characterized as a monument of engineering skill. The address concluded by expressing the esteem in which Mr. Marks was held by all the inhabitants of Llandudno. Accompanying the address, which was illuminated and framed, were a silver service, a silver salver bearing a suitable inscription, and an album containing views and the names of the subscribers to the testimonial, which included a gold watch set in a gold bracelet for Mrs. Marks. The presentation was made by the Chairman, who proposed in felicitous terms the health of the guest of the evening. The toast was cordially honoured. Mr. Marks responded; and after a few other toasts, the proceedings, which were throughout of a very hearty character, were brought to a close.

Breeze Concrete and Iron Building Construction.—An altogether new system of building construction, involving the free use of gas-works breeze and cement concrete, has been invented by Mr. F. G. Edwards. Joists manufactured under Mr. Edwards's patent were recently tested by Mr. Kirkaldy, with favourable results. These joists were of different sections, but were all made in the same way, of breeze concrete in which were imbedded several iron rods of small diameter. The concrete for all the specimen joists was composed of equal proportions of coke breeze and cement; some being 21 days, and others 17 days old. The breeze for the 21-day specimens was passed through a ¼-inch mesh sieve; that for the 17-day samples, through a ½-inch mesh screen. The joists intended for ordinary flooring are furnished with grooves of soft concrete on the upper face for nailing into, which is a necessity for this purpose, but tends to weaken the joist. A typical example of a joist of this construction is rectangular, 7 inches deep by 3 inches wide, carrying three ½-inch round-iron rods, imbedded so as to form a triangle in the section, near the bottom edge of the joist. This would seem to be the best shape for a concrete beam; the number of inserted iron rods being varied at discretion. A beam of this kind, seven days old, supported on bearings 10 feet apart, and loaded in the centre, began to crush on top at a pressure of 2874 lbs., with a deflection of 1·48 inches. The tests carried out at Kirkaldy's works seem to establish the fact that concrete combined with iron rods will sustain a far greater cross-strain than concrete is able to bear alone; but experiment is apparently needed to determine the proportions which the iron and concrete should bear to each other, so as to ensure that the iron which is imbedded in the portion of the beam exposed to tension shall begin to fail just when the upper portion of the beam commences to crush under compression. It would also appear wholly unnecessary to gauge the concrete so highly in cement; a mixture of eight or ten parts of breeze to one part of cement, left to harden a reasonable time, would answer every purpose.

WATER AND SANITARY AFFAIRS.

Mr. Rickards, in opening the case for the promoters of the Metropolis Water Supply Bill, before the Select Committee of the House of Commons, made some explicit statements of considerable interest. He demanded for the authority that should take action under the Bill "a "monopoly of the supply;" but he denied that any such monopoly was possessed by the Water Companies. At the same time, the learned Counsel stated that because the authority was to have this monopoly, the promoters of the Bill considered it to be incumbent upon that body to acquire the existing undertakings. Assuredly, neither a Water Trust nor the County Council could monopolize the field, unless the Water Companies were first disposed of. The Bill of the Vestries and District Boards is therefore designed to grasp the whole area of the supply. The Companies are to be bought up; and the public authority is to have no rival. This is very proper, providing the transaction is fairly conducted, though we cannot see the logic of denying a monopoly to the Companies, which is surely as needful for them as for the public authority, and which in their case is subject to regulation on behalf of the consumer. As for the water itself, the Vestry Bill proposes that this shall be obtained pretty much as it is now; but it is to be "supplemented" from sources at present commanded by the Leatherhead and Rickmansworth Companies, whose undertakings are to be purchased. Concerning an independent supply—by which phrase something in the nature of competition seems to have been understood—Mr. Rickards expressed a doubt whether such a thing was either possible or advisable; and the Chairman interposed with the observation that the Committee did not require any statement on the subject, "as the difficulties of an independent "supply were too obvious." This is one landmark in the inquiry; and the Chairman speedily established another, by saying the Committee "took it for granted" that economy would be effected by placing the supply in the hands of a central authority. The Chairman's declaration had more especial reference to economy in the distribution; and Mr. Rickards followed on with the argument that, by making junctions between mains, elevated districts could be supplied more readily from high-service reservoirs. In other words, a sort of zone system, governed by the contour of the ground, could thus be made to operate. We may here observe that this reform in the distribution is one which the Companies themselves might effect by a system of mutual agreement, aided possibly by a Central Committee. In arranging the districts, a give-and-take policy has already been observed; and a further application of the same principle might have been found advantageous.

As to the terms and conditions on which the undertakings of the Water Companies are to be acquired by the public authority, some smooth things are said on behalf of the promoters of the Metropolis Water Supply Bill; but when we come to particulars, the way looks rather rough. Some complicated conditions are introduced for the purpose of excluding from the reckoning a certain portion of the invested capital. The price to be paid is to be regulated only by the value of the undertakings prior to the bringing of the Bill into Parliament. It is allowed that in some cases there might be a long interval before the terms were settled. As proposed by the Bill, a Company would have no claim for compensation, or a very doubtful one, in respect to any new works that might be constructed during the interval; the argument being that these new works "might be useless to "the Water Trust when it came into office," and would simply serve to inflate the claim for compensation. But the works might not be useless, and might be very much required; and as every Company is bound to give a supply to the inhabitants of the district, it is a perilous thing to say that they shall stay their hands and make no provision to meet the rapidly-growing demand during a period of uncertain duration. From the time this Bill is introduced, no improvements or extensions are to be effected; but the supply is to remain as it is. It is proposed to add certain words to the Bill, requiring the Board of Arbitration to have regard to various matters connected with the supply, concerning which the widest divergence of opinion may exist. The whole of this complication might have been avoided by the simple and equitable plan of giving the shareholders and others a fair equivalent for their interest in the undertakings. These parties could thus be "bought out." But if the Board of Arbitrators are to go into all sorts of nice questions as to the usefulness of the existing works, their suitability for the purposes of the Trust, their prospective utility under altered circumstances in the future, and the effect of all sorts of contingencies, real and imaginary, it is impossible to say how the calculation may come out. In fact, the whole device is well adapted to run the value down to that point which shall gratify the expectations and aid the finances of the London County Council.

Following the address of Mr. Rickards, we have the evidence of Mr. H. Wilkins, the Vestry Clerk of St. James, Westminster, and Honorary Secretary to the promoters of the Bill. This gentleman approved of a Trust representing the whole area of the supply, in preference to the County Council. He explained that the clause requiring the Board of Arbitrators to have regard to the value of each undertaking prior to the introduction of the Bill, was intended, among other things, to prevent any claim being set up in respect to additional income arising from the late quinquennial valuation. The capital value of this increase was estimated at something like £950,000. So the Companies are to be mulcted in this amount, if the promoters of the Bill can have their way. Probably the parties whose interests are at stake will know how to appreciate the statement made by Mr. Wilkins, that the compensation received by the Companies "would be either more or "less than the market value of their stock, according to "the award of the Arbitrators." As the idea of coming up to the market value has been scouted, what chance the Companies have of getting "more" may be left to the lively imagination of a Vestry Clerk. In the evidence given by Mr. Wilkins last Wednesday, the principle on which the purchase is to be effected was very neatly expressed. The proposal was "to buy the Water Companies' property as "undertakings, and not as revenue-making concerns." What do the shareholders think of this? Did they invest their money simply in "undertakings," or in concerns capable of making a "revenue"? With regard to the engineering evidence, we may say something at another time.

At the half-yearly meeting of the West Middlesex Water Company, held last week, the Chairman, Sir W. H. Wyatt, expressed a hope that, when the transfer of the undertakings was decided upon, the Companies would get fair terms. He believed that they would. Concerning this expectation, we may observe that the Metroplis Water Supply Bill is not yet law, and may never reach that point. It may be considerably amended, or it may altogether fail to get through Parliament. The opposition of the London County Council is a curious element in the question. As for the public interest in this matter, Sir W. H. Wyatt gave utterance to some very reasonable doubts. The ratepayer, as well as the consumer, is likely to be affected; and the enormous sum now paid by the Companies in the shape of rates will have to be balanced in some way. The customers of the West Middlesex Company have particular reason not to desire any change, as the interposition of the public authority will be certain to sweep away the rebate which they now enjoy, and which has just been raised from 5 per cent. to 7½ per cent. In one respect, the Directors of the West Middlesex Company have been both lucky and discreet. They have issued the balance of their perpetual debenture stock, amounting to £50,000, just in time to escape the species of confiscation proposed by the Metropolis Water Bill, as described in our preceding remarks.

Increase in the Salary of the Burnley Gas Engineer.—At a meeting of the Burnley Town Council last Wednesday, the salary of Mr. John P. Leather, the Gas Engineer of the Burnley Corporation, was increased by £50 per annum.

Mr. R. Garraway Rice, F.S.A., Barrister-at-Law, has been appointed on the Board of the Mitcham and Wimbledon District Gaslight Company and elected a Director of the West Kent Gas Company, in the place of the late Mr. Robert Rice.

The Gas and Water Companies' Directory.—We are asked by the publishers of the above-named work to call the attention of those officials of gas and water companies who have not yet returned their corrected forms for the issue of the Directory and Statistics for the current year, to the advertisement which appears in another part of the Journal to-day, in which they are requested to do so before the 16th inst., in order that the book may appear at as early a date as possible.

THE INCORPORATED INSTITUTION OF GAS ENGINEERS.

PROCEEDINGS AT THE FIRST ANNUAL MEETING,

HELD AT THE

INSTITUTION OF CIVIL ENGINEERS, MAY 12 & 13, 1891.

Mr. G. C. TREWBY, M. Inst. C.E., President.

INAUGURAL ADDRESS.

GENTLEMEN,—The first thing that I have to do in coming before you with my address is to thank you for the honour conferred upon me in electing me first President of the Institution of Gas Engineers—an honour which I should altogether have abstained from seeking, and which I feel is conferred upon me because of the position I occupy as Chief Engineer of one of the oldest and largest gas undertakings in the world. In the next place, allow me to congratulate you upon the success, so far, of the new Institution, which, although only in its infancy, so far as numbers are concerned, is yet representative, firstly, of the whole of the London district; and, secondly, taken in its entirety, is representative of a capital expenditure on gas undertakings of upwards of £23,000,000.

With such a beginning, in the first year of its existence, one should be able with some degree of certainty to predict its sure and certain growth year by year; and especially since it is under the guardianship of such gentlemen as have enrolled themselves as its first members, most of whom I have the pleasure of seeing before me. I may be permitted also to remind the meeting that we do not aim so much at swelling the numbers of the Institution as at making it in all respects a thoroughly representative society of the science of gas industry, of banding together a body of gentlemen whose sole aim and object is the advancement of this science, and the extension of the application of gas to household and industrial purposes. Thus, in the words of the Charter of the Institution of Civil Engineers, "directing the great sources of power in Nature for the use and convenience of man."

Having said this much, let us first consider what progress our industry has made during recent years. The year 1882 is the first year that I have been able, from the public accounts, to total together the gas undertakings in the United Kingdom. Going back to that year, I find that the amount of money invested in these undertakings (embracing both local authorities and companies) amounted to £50,261,118. The quantity of coal carbonized was 7,280,757 tons; making 72,583,343,000 cubic feet of gas. The quantity of gas accounted for was as follows: To private consumers, 61,307,118,000 cubic feet; for public lighting, 5,311,826,000 cubic feet—total, 66,613,944,000 cubic feet. The number of consumers supplied at this time was 1,971,971; and the average consumption for each consumer was 31,087 cubic feet. The year 1889 is the last year for which statistics have been compiled. The return for that year shows that the expenditure on capital account had increased to £59,877,537. (And I may explain that, in addition to this, a large sum had been written off by local authorities in respect of the redemption of their obligations; otherwise the capital would have stood at a higher figure.) The quantity of coal carbonized for the year under consideration (1889) amounted to 9,663,011 tons; making 98,081,283,000 cubic feet of gas. Out of this the quantity accounted for to private consumers was 83,140,167,000 cubic feet; and for public lighting, 7,112,428,000 cubic feet; or a total of 90,252,595,000 cubic feet. The number of consumers supplied at this period had risen to 2,244,105; and the average consumption for each consumer had also risen to 37,048 cubic feet. It will thus be seen that, during these seven years, there has been an increase in the capital expenditure equal to 19·13 per cent.; an increase in the amount of coal consumed equal to 32·72 per cent.; an increase in the number of cubic feet of gas made equal to 35·13 per cent.; and an increase in the total number of consumers equal to 13·8 per cent.; while for each consumer there is shown an increased consumption equal to 19·18 per cent.

It will be interesting now to see how this increase in the gas consumption compares with the increase in the population. The population of the United Kingdom for the year 1882 was estimated at 35,297,114; and for the year 1889, at 37,823,249. Comparing this with the number of gas consumers, it will be seen that in 1882 about one out of every 18 persons burnt gas; while in the latter year it will be seen that a greater proportionate increase had taken place, and that one out of every 17 persons was a consumer. This fact, taken in conjunction with what I have previously stated—viz., that each consumer has, on the average, increased his consumption by 19·18 per cent.—is, I think you will agree with me, a very satisfactory state of things.

Taking the example of London by itself, and going back ten years to the year 1880, I find that the case of the three London Companies stands as follows: In that year the amount of capital raised was £13,114,465; the quantity of coal carbonized was 1,918,233 tons; the gas made was 19,603,159,000 cubic feet; the gas sold to private consumers was 17,131,625,000 cubic feet, and for public lighting 1,139,938,000 cubic feet—making a total of 18,271,563,000 cubic feet; the number of private consumers was 263,922; and the quantity of gas sold to each consumer was 64,912 cubic feet. In the period of ten years I find that the above figures have increased as follows: Capital raised, to £15,121,851, or an increase of 15·31 per cent.; coal carbonized, 2,801,557 tons, an increase of 46·05 per cent.; gas made, 28,324,501,000, an increase of 44·49 per cent.; gas sold to private consumers, 24,919,681,000 cubic feet, an increase of 45·45 per cent.; gas sold for public lighting, 1,513,892,000 cubic feet, an increase of 32·8 per cent.—making a total of 26,433,573,000 cubic feet, or an increase of 44·67 per cent.; the number of private consumers, to 309,541, or 17·29 per cent.; and the gas sold to each consumer, to 80,505 cubic feet, equal to 24·02 per cent.

This shows the advance that has taken place in gas consumption during recent years. Coming down to the present time, I may state that my own Company have an increased consumption equal to 10 per cent. for the first three months of this year as compared with the corresponding period of last year. Of course, this abnormal increase is partly owing to the very cold and dull weather which we have experienced.

One feature of the increase in the consumption deserves to be noticed. I have taken out the figures of my own Company at different periods during the year; and I find that the day consumption has advanced in a very much larger proportion than the night. Although, of course, the day consumption is extremely variable, owing to the state of the atmosphere and the temperature, there is not the slightest doubt that it is growing at a much more rapid rate than is the night consumption. And it is in this field, as well as that of lighting, that gas undertakings must look in the future if they wish to largely increase their rental.

Pursuing this subject, it is encouraging, in taking out statistics showing to what extent gas is used other than for lighting purposes, to notice what position we are in at the present time with reference to this portion of our business—the use of gas for cooking and heating purposes. I find, in the case of my own Company, that the number of gas-stoves on hire and of those which have been sold to consumers amounts to no less a figure than 40,000; in the case of the South Metropolitan Company to 16,000; and in that of the Commercial Company to 3314. Besides this, there are a large number which have been bought privately, and which it is impossible to estimate with any degree of certainty, but which would probably amount to at least 10,000 more. So that, in round figures, there must be 70,000, or even more, cooking and heating stoves in London alone. Besides this, in the districts which The Gaslight and Coke Company and the South Metropolitan Company supply, there are upwards of 2500 gas-engines at work. So that I may say, with reference to this field of our business, that we are literally advancing by "leaps and bounds;" and I have no doubt that other gas undertakings have the same experience. In almost every case, it has been as much as the several undertakings could do, in various parts of the country, to keep up a sufficient supply during the recent severe winter.

The rapid development of the use of gas for industrial and heating purposes, raises questions of much interest in relation to capital expenditure. The argument is often used that this demand may properly be stimulated by charging

a lower rate for the gas so employed; the chief reason assigned being that, as the demand arises chiefly during the hours of daylight, the distributing plant is more uniformly employed during the 24 hours, and that, in fact, the extra business is obtained without any necessity for enlarging either gasholders or mains. The experience of the past few years does not fully confirm this view. In so far as there has been a greater percentage of increase in the daylight demand as compared with that after sundown, the percentage of necessary storeage to the whole has been diminished. But, on the other hand, if upon a winter's day the maximum for heating and industrial purposes and for lighting are coincident in point of time, then necessarily the mains will have to be proportioned to the aggregate demand; and the capital spent upon them will be the same as if the whole increase had been due to lighting only.

The diagram upon the wall has been prepared to show the effect of increased daylight consumption within the district of The Gaslight and Coke Company in the ten years between 1880 and 1890. Taking the 24th of June, 1880 (which was an average summer day), the total consumption for the 24 hours was 22,816,000 cubic feet, which was decided as follows: Between the hours of 8 P.M. and 3 A.M. (which may be termed the night consumption), the quantity was 13,517,000 cubic feet, or 59·24 per cent. of the whole; the difference—viz., 9,299,000 cubic feet, or 40·8 per cent.—being reckoned as the day consumption. Now, comparing this with the same day of the month of June, 1890 (which was comparable as far as weather is concerned), we find the total consumption was 32,368,000 cubic feet, or an increase of 41·86 per cent. The consumption between 8 P.M. and 3 A.M. was 16,225,000 cubic feet, or an increase of 20·03 per cent. over 1880; while the day consumption had risen to 16,143,000 cubic feet, or no less than 73·59 per cent. In making a comparison between two winter days at an interval of ten years, in order to compare the same kind of weather during the daylight consumption, I have selected the 25th of January, 1881, and the 6th of January, 1891, and have taken the hours between 9 A.M. and 3 P.M. for daylight consumption. This in 1881 was 10,234,000 cubic feet; and in 1891 was 19,448,000 feet, or an increase of exactly 90 per cent.

On the same diagram I have marked a curve (supplied to me by Messrs. Ellington and Woodall), showing the output of the London Hydraulic Power Company on an ordinary day. This latter is, of course, a supply for power purposes only, and is a day as distinct from a night service. It will be seen that here the demand does not seriously fall off from its maximum till after the maximum demand for gas has been reached. The so-called day consumption, therefore, does not simply fill in the empty space in the diagram where lighting is not wanted, but climbs to the height which marks the greatest demand for light; and the maximum output on a winter's day is the aggregate of the greatest demands for each—viz., light, heat, and power.

It follows from this that the increase on day consumption, tending as it does towards equalizing the output, will justify a reduction in the proportion of storeage to make. On the other hand, I think it shows that, because of the overlapping of the times of greatest consumption, the size and consequent cost of mains, which must be equal to the requirement not of the heaviest day but of the heaviest minute, will advance directly as in the past, or must be met by working increased pressures, if practicable. Of course, this in no sense detracts from the great advantage which these industrial applications of gas afford, by raising the summer consumption, and so more uniformly employing the whole plant—manufacturing as well as distributing.

As compared with electrical distribution, gas has at least this great advantage—that the manufacturing plant up to the maximum required at any given period is worked uniformly through the 24 hours, and the cost of storeage to meet inequalities of demand is limited to gasholders. An electric lighting station may adopt one of two plans. It must either have practically the whole producing plant idle for the greater portion of the day, or must fit up accumulators to serve the purpose of a gas company's holders. In the latter case, I believe that not only will the capital expenditure be proportionately much greater than with us, but, as the whole of the current put in is not got out again, there is a further loss in working.

I have no intention to attempt a comparison between the cost of gas and electricity as supplied to the consumer. The experience with the latter is still not sufficient to furnish materials for such a comparison on a commercial basis. I may, however, use a few figures given in a recent and most interesting paper read, in this Institution, on the cost of generating and distributing electricity, by Mr. Crompton, in order to show how the comparison at present stands for generating or manufacturing only.

The cost of generating an electrical unit equal to 1¼-horse power is given, in two typical cases, as respectively 1·41d. and 1·08d., when the conditions as to supply were the most favourable. This is for coal, labour, and petty stores. This is equal to 1·06d. and 0·8d. per horse power. Now these same items in the cost of London gas do not average more than 10d. per 1000 cubic feet; and allowing a maximum of 25 feet as necessary to the production of 1-horse power in a gas-engine, the cost is 0·24d., or less than a third of the minimum electrical estimate. Or, if we take the cost of gas, as delivered to the consumer in London, at 2s. 9d. per 1000 cubic feet, the cost of 1-horse power to the user is 0·83d., which is very much less than the cost of materials and labour in generating the electricity, leaving distribution, loss, wear and tear, and dividends unconsidered. So that, however anxious electric light companies may be to promote the use of electricity for power purposes, they will have to cheapen the cost to an enormous extent before they can compete with gas, considering that the larger size of gas-engines (as I am informed by the makers) are now made to develop 1-horse power with only 16 cubic feet of gas.

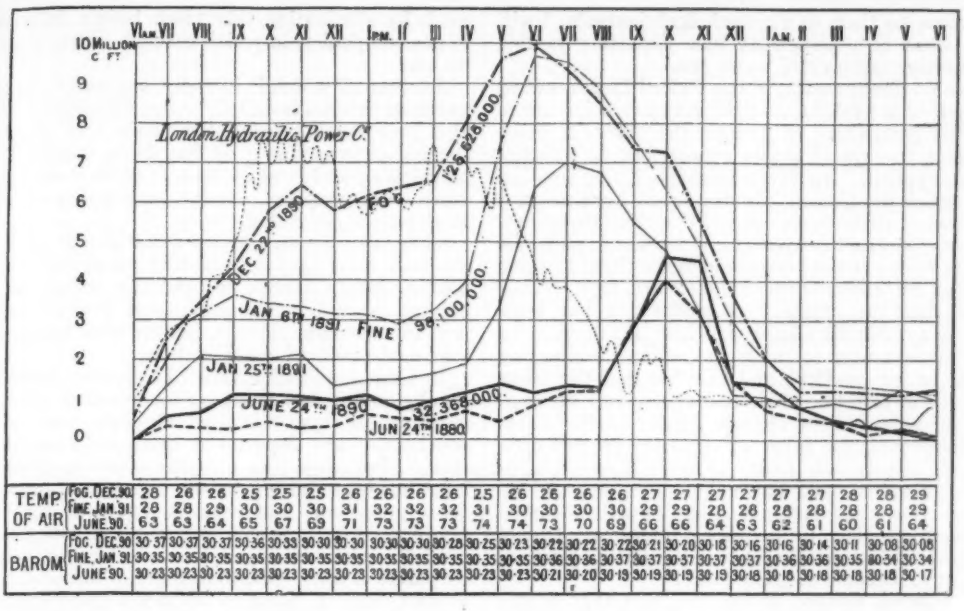
Having so far demonstrated that the demand for gas goes on increasing to a very satisfactory extent, and having shown what a wide field is opened up for us in the extended use of gas for industrial and domestic purposes as well as for lighting, I will now direct your attention to what is the main question for us as gas engineers—viz., how best to meet the demand so far as manufacture is concerned by turning out gas at the cheapest possible cost.

In the first place, dealing with the raw material, coal. Having paid as little as we possibly can for it, delivered alongside our works, we have to consider the most economical way of getting it into the works. Having in view the recent difficulties that we have had in connection with labour, and having also in mind the desirability of lessening the hard muscular work as far as possible, we have turned our attention in a greater degree to the introduction of mechanical appliances for this purpose—notably, in the first instance, to that of self-filling coal-grabs, by which the cost of the manual labour of filling coals is reduced 85 per cent. This is a process which you may be sure we are seeking to extend; and it is under contemplation to arrange steamers in such a manner that they may be discharged in this way; thus avoiding the laborious work of coal filling.

With reference to this subject of coals, it has been found necessary during the last year, and appears to be necessary in future, in order to meet the exigencies of the coal mining industry, to take in pretty equal monthly deliveries of coal during the whole of the year. This, of course, necessitates having a very large stock on hand; and although this is attended with very serious inconvenience and loss from depreciation, yet in order to provide for the possible cessation of supply for a time, it is a measure which seems to be necessary.

Then, of course, this opens up the question of coal storing and reloading plant; and this, as most of you know, is a subject which has been dealt with in the United States for some years past, where they have extensive machinery in use for the purpose of depositing and reloading the coal. I may also mention that my Company have entered into a contract for plant, to be erected at our Fulham station, for storing in one heap 30,000 tons of coal, and also for an appliance called a "Reloader," which will take the coal, when required, into the retort-houses, and so obviate the necessity of hand labour. This will be the first introduction of such plant into this country; and I have every reason to believe that it will effect an important saving.

The next point to consider is—Having got our coals deposited in a proper position as regards the retorts, what is the most economical means of converting them into gas? You, of course, are all aware of the different mechanical means in use for charging and drawing horizontal retorts.



		VI AM	VII	VIII	IX	X	XI	XII	I PM.	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	I AM.	II	III	IV	V	VI
TEMP OF AIR	FOG. DEC. 30	28	26	26	25	25	25	26	26	26	26	25	26	26	26	26	27	27	27	27	27	27	28	28	28	29
	FINE. JAN. 31	28	28	29	30	30	30	31	32	32	32	31	30	30	30	30	29	29	28	28	28	28	28	28	28	29
	JUNE 90.	63	63	64	65	67	69	71	73	73	73	74	74	73	70	69	66	66	64	63	62	61	60	61	64	
BAROM.	FOG. DEC. 30	30·37	30·37	30·37	30·36	30·33	30·30	30·30	30·30	30·30	30·30	30·28	30·25	30·23	30·22	30·22	30·22	30·21	30·20	30·18	30·16	30·16	30·14	30·11	30·08	30·08
	FINE. JAN. 91	30·35	30·35	30·35	30·35	30·35	30·35	30·35	30·35	30·35	30·35	30·35	30·35	30·35	30·36	30·36	30·37	30·37	30·37	30·37	30·37	30·36	30·36	30·35	30·34	30·34
	JUNE 90.	30·23	30·23	30·23	30·23	30·23	30·23	30·23	30·23	30·23	30·23	30·23	30·23	30·23	30·21	30·20	30·19	30·19	30·19	30·18	30·18	30·18	30·18	30·18	30·18	30·17

But what, in my mind, is likely to be the retort of the future is one set at such an angle that the coke will run out without raking, and the coal will be deposited by shoots of some kind in an even layer against a stop fixed to the retort-lid. We are, of course, indebted to M. Coze for having led the way in a practical manner, and shown us how far this method can be carried into operation; and your attention will be directed, by a paper which will be read at this meeting, to a large installation which my Company have put up at their Kensal Green works on this gentleman's plan, with its adjuncts of coal lifting and distributing machinery, and which installation you will have an opportunity of inspecting.

Without entering into any lengthy description of the apparatus, I may mention that the retorts are set back to back, and each is fitted with a cast-iron charging-bend. This bend was a source of trouble at first, owing to its getting too hot, and in one or two instances burning out; but since we have guarded against this difficulty, the working of the retorts has been satisfactory. At the time we decided to put in these retorts, no other plan of sloping retorts had been tried; but now that it has been demonstrated that the cast-iron bend can be dispensed with by bringing the retorts through the back wall and putting on a short mouthpiece and charging by moveable shoots, I think that this is a far preferable plan. Then another thing that we find is that the coke will not run out at the angle adopted by M. Coze without being touched up; although, of course, the labour on this portion of the work is light as compared with horizontal retorts. Another point, which of course was expected, is that, according to the velocity with which the coal is poured into the shoots, so is the distribution over the bottom of the retort more or less perfect. It was upon a consideration of what I thought might be the difficulty attendant on M. Coze's plan of charging, modified by Messrs. Morris and Van Vestraut, that I devised a plan of charging a retort, placed at a greater angle than that of M. Coze, by means of the insertion of a plate which is run in at such a distance from the bottom of the retort as to regulate the thickness of the charge. By this means, I ensure an even layer of coal over the bottom of the retort; and another advantage of this system is that the coke runs out without any trouble. This plan is in operation at our Beckton works to the extent of 144 retorts, 15 feet long.

The cost of an installation of inclined retorts is, of course, more than for horizontal ones; but the economy in working them pays for the increase in capital expenditure. The saving in the cost of carbonizing is the difference between the respective systems in the cost of putting in the coal and drawing out the coke. Now, in horizontal retorts the cost of these operations, in the case of my Company (supposing the men do their allotted work), is 1s. 6d. per ton. The cost for the same labour on the Coze plan is 10½d. per ton; and the cost on my plan (exclusive of wear and tear of machinery) is 6d. per ton. These facts, I think you will agree with me, are very encouraging, and must necessarily lead to a large development of whichever system is found by experience to be the best.

Following up the idea of the employment of mechanical appliances, several schemes have been suggested for extending the use of conveyors to coke, for the purpose not only of storing it, but also of conveying it to the place for loading. Other developments also in the direction of charging and discharging purifiers claim our attention; and, speaking generally, when we consider that (without reckoning the cost of labour employed in the wear and tear of a gas manufactory) the sum expended on coals, carbonizing, coke and breeze, and purification amounts to 5s. or 6s. per ton of coal carbonized, it will be plainly seen what a wide field is opened up for the exercise of mechanical ingenuity in dispensing with the laborious part of the operations under these heads. Indeed, I have no doubt that, in the course of a few years, we shall see a very great development of mechanical appliances wherever they are found to be applicable.

While on the subject of labour, I may remark that most of us have passed through a period of great anxiety during the past winter, especially considering the fact that our industry is one that must not be allowed to stop; but we have, on the contrary, to be ready at all times to keep up from day to day such a supply of gas to the public as they may require owing to the necessities of the weather. I wish I could say that the stokers at all our stations take the same intelligent interest in their work as they did at one time; but our experience is that a greater amount of supervision is necessary now in order to get the work of the retort-house properly performed. This ought not to be; and I for one should be delighted if some means could be found by which every gas worker could feel his own personal interest identified with the success of the undertaking in which he is engaged, and so be stimulated to do his best for his employer.

We must all look forward with interest to the forthcoming deliberations of the Labour Commission; and it is a subject of congratulation that the interests of gas undertakings as affected by labour troubles will be looked after by our friend, Mr. George Livesey, whom we have the pleasure of reckoning amongst the members of our Institution. Let us hope that the Commission will be able to recommend such a solution of the difficulties that beset us as will be satisfactory to all parties, both employer and employed.

Now, experiencing as I do the difficulty in saying anything new in regard to the interior economy and conduct of a gas-works, in the face of the flood of admirable presidential addresses which are delivered at the different District Associations in the North, South, East, and West of the United Kingdom, together with the excellent papers produced at these meetings, and also the contributions

made from time to time to the technical journals, I will pass on to what is a somewhat new departure in this country—namely, carburetted water gas.

As you are no doubt aware, in the United States, owing to the cheapness of naphtha and oil, very extensive use is made of this description of gas by the different companies; in fact, in several towns nothing but carburetted water gas is supplied. Another advantage, I may mention in passing, which the United States possess over us in a certain portion of their territory, and that is, natural gas. This is also carburetted and used for illuminating purposes as well as for fuel. It has been found in the United States that, owing to the competition of the electric light, something more than the ordinary 16-candle gas has been required. As a result the companies have laid themselves out in several instances to make gas of an illuminating power equal to 30 candles; and this has had the effect of enabling them to retain their customers, and of stopping the development of the electric light. As far as this country is concerned, the price of oil at the present time is not at a sufficiently low figure to make it pay in competition with common coal for making gas of (say) 16-candle power; but, considering the scarcity and enormous rise that has taken place in the price of high-class cannel during the last twelve months, it bids fair for the purpose of enrichment to become of great value.

There is another feature of the question that is also worthy of notice. In the Metropolis, and, I have no doubt, in several other towns, it is found necessary at the beginning of winter to light up a certain percentage of retorts, and keep them in reserve against foggy weather, which may or may not come. This plant will continue burning fuel and incurring expense in wear and tear and labour for days and days, until it is required; whereas with properly equipped water gas plant, it is possible to start making gas within twelve hours of the time of lighting up. Another great advantage connected with it is that, compared with coal gas manufacture, it only requires about one-fourth the number of men to work it. So that I think we have every reason to congratulate ourselves upon having a very useful adjunct, which will be more and more developed as the price of oil comes down; and this, I am informed by those most competent to judge, there is every indication of its doing.

As you will have two papers put before you on the subject of carburetted water gas, I will abstain from going into any minute details on this subject. I will merely state the fact that my own Company, already possessing plant (erected on the improved Lowe system), designed by the United Gas Improvement Company of America, capable of making 2 million cubic feet of gas per diem, have decided on my recommendation, to extend this by the erection, against next winter, of plant capable of making 6 millions more per diem. With this, we hope to be able to meet the increasing and sudden demands that are made on our resources, especially just at the time when, owing to the severity of the weather, we have to largely increase our use of enriching material.

There is another advantage connected with this system—it provides a use for gas coke, should it ever happen to become a drug on the market. The space occupied by a carburetted water gas installation is comparatively small. A million cubic feet per diem could be made on a piece of ground 50 feet by 100 feet. The capital outlay, too, as compared with coal gas plant, is much less. The cost per 1000 feet for (say) 25-candle gas would, I estimate, not exceed 1s. 10d.—this, of course, depending on what value is placed on the coke, and also the price at which it is reckoned suitable oil can be obtained.

In connection with this matter, I understand that Professor Lewes is engaged in making experiments with a view of utilizing the condensable oils from coke-ovens in the carburetting of gas. This, if successful, would largely augment our oil supply.

Deposits of petroleum, as you are doubtless aware, have been discovered in all parts of the globe, of a more or less useful character for gas-making purposes; but the particular oil which at the present time is most available for use, on the score of cheapness, in this country, is the thick oil from Russia, which goes by the name of "Novorossisk." This has a high flashing point; the objection to its use being that it contains a certain amount of pitch, which is apt to deposit on the bricks of the carburetting vessel. Arrangements, however, are being made for eliminating this pitch before delivering the oil to gas companies, in which case no difficulty would attend its use.

Another oil which is in every way suited for gas-making purposes is what is called "Solar Distillate." This comes also from Russia, and is the product of distillation after the kerosene or lamp oil has been taken off the crude petroleum; and is at present used in Russia for fuel and lubricating purposes. It can be supplied in this country at about 3d. per gallon.

There are, of course, large quantities of crude petroleum available for shipment from the United States; but the low flashing-point of this oil, and the danger attending its carriage, as well as the restrictions in the manipulation of it in this country, place it, for the time being, outside the region of practical consideration.

In a communication which I have from a gentleman who is fully qualified to speak on the question of the petroleum industry, he says: "It is an absolute truth to state that the bulk of the deposits of the world have hitherto been almost disregarded, because the object in procuring petroleum has been limited to the one idea of procuring oil for lamp purposes. But once it becomes recognized that petroleum in any shape, or even oleaginous earths, can be made to produce an oil suitable for the manufacture of carburetted water gas, the supply of material becomes unlimited, and it becomes simply a question as to which supply is obtainable at the cheapest cost."

One other subject, I think, is of great interest to us as gas makers. You may all have noticed for some years past, especially during the prevalence of fogs, that public attention has been drawn to the advisability of devising by some means a scheme whereby the smoke could be eliminated from the atmosphere of towns. Whether or not this will ever be done by legislation is an open question; but there can be no doubt it would be of extreme advantage to the community at large if the fuel used, not only in manufactories, but also in private houses, were of a smokeless character. And in this direction gas undertakings are able to offer a panacea for the evil. It has been lately suggested that a separate system should be started, by which the public should be supplied with non-luminous fuel gas. But when we come to examine into the question, and consider what is involved in the matter of supplying non-luminous water gas, we find how difficult and almost impracticable it becomes. In the first place, although the manufacturing plant per 1000 cubic feet would cost less than for illuminating gas, yet, inasmuch as the consumption would be intermittent from hour to hour and from day to day—depending on conditions of the weather—very large accommodation would have to be provided, though, perhaps, not in quite the same proportion as for illuminating gas. That is to say, assuming, for example, that, according to the present requirements, it was found necessary to provide storeage room for one ordinary winter day's consumption as applied to illuminating gas, there is no reason that I can see why an undertaking for the sole purpose of supplying heating gas should not require at least 50 per cent. of a maximum ordinary day's consumption in gasholder storeage so as to be able to continue making in a regular quantity throughout the 24 hours.

The following, therefore, to my mind, is a fair comparison between the two systems, as far as capital is concerned:—

COST OF PLANT FOR MANUFACTURING, STORING, AND DISTRIBUTING ONE MILLION CUB. FT. OF GAS PER DIEM.

16-Candle Gas.

Manufacturing plant, including land	£40,000
Gasholder and tank	10,000
Distributing plant	30,000
Total	£80,000

Non-Luminous Water Gas.

Manufacturing plant, including land	£10,000
Gasholder and tank	5,000
Distributing plant	30,000
Total	£45,000

Looking at these figures it would appear at first sight that, in respect to capital, there is a saving in favour of non-luminous gas. But when we consider that it would require two feet of the latter to do the same work as one foot of 16-candle gas, it follows that to produce the same

calorific effect, the above capital for water gas would have to be doubled. The figures, therefore, would stand at £90,000 per million, as against £80,000 for 16-candle gas. Then coming to the cost of the two gases, I do not think that non-luminous water gas, sufficiently purified, could be manufactured in the neighbourhood of London for less than 6d. per 1000 cubic feet, compared with 1s. for 16-candle gas; and as the latter will do twice the work of the former, no saving is here shown. One other matter deserves consideration. With a city like London, to have a second set of mains in some of the thoroughfares would be almost impracticable.

Taking, then, all things into consideration, the solution of the problem of how to keep the atmosphere pure from carbon particles is, to my mind, to be found in the extension of the use of luminous gas, either by itself or in conjunction with coke (as shown in the admirable pamphlet by Dr. Pole) for all purposes for which bituminous coal is now used. I may add that, in my opinion, if an abundant and cheap supply of oil could be ensured, it is most probable the public would prefer to be supplied with, and would pay for, gas of a higher illuminating power than 16 candles. This, at the same time that it would possess a somewhat higher calorific value, would enable the present mains and services to do more work in relation to both light and heat.

In conclusion, allow me to say that, as we are quite a new Institution, and have no history beyond what has been detailed in the report of the Council, I will refrain from any retrospection, feeling that this is better done from time to time by the technical journals connected with our industry. It now only remains for me to take this opportunity of thanking those of my friends who have assisted me with information for my address, and also you, gentlemen, for the patience with which you have listened to it. I trust that I have not wearied you by my endeavours to show what a great future exists for us in the further development of the industry with which we are associated.

Mr. W. Chew, Assistant-Manager of the Blackpool Corporation Gas-Works, has had his salary increased to £200 a year, inclusive of any allowance on account of the electric light works.

Mr. John Stanway, who for twenty years has been connected with the staff of the water-works of the Huddersfield Corporation, and for ten years has acted as Manager, died last Saturday week, at the age of 63.

Mr. Arthur Barton, the Manager of the Chichester Water-Works Company, died on the 1st inst., at the premature age of 40 years. Death was due to kidney disease, which was probably aggravated by a fall which the deceased sustained from the theatre steps at Portsmouth a few days previously, and which afterwards brought on convulsions.

The Annual Inspection of the Glasgow Water-Works, which will take place next August, will be attended by the Lord Mayor and Sheriffs of London, who have accepted the invitation of the Water Commissioners of Glasgow to be present. The works, it may be remembered, include Loch Katrine, Loch Vennacher, Loch Achray, Loch Lomond, &c. The visit is to be paid in order that the City authorities may see what Glasgow has done in providing a practically inexhaustible supply of water, not only to that city, but to the surrounding populous districts.

The Royal Society.—The first *conversazione* of this Society for the present session was held on Wednesday evening last, at Burlington House, Piccadilly—the guests being received by the President (Sir W. Thomson). The exhibits were not so numerous as on previous occasions; but the most recent forms of scientific apparatus were shown, and demonstrations of the latest features of scientific research were watched with interest. Among other interesting demonstrations, Mr. W. Crookes, F.R.S., exhibited some very beautiful and striking experiments with electricity in high vacua, especially in the production of phosphorescence. The Council of the Society have selected fifteen candidates for election on the 4th prox. Among them is Mr. W. Anderson, M. Inst. C.E., Consulting Engineer to the Royal Agricultural Society of England, and known to many of our readers for his process for the purification of water on a large scale by agitation with iron, as carried out by him at the Antwerp Water-Works, as well as for his lectures on "The Conversion of Heat into Useful Work," delivered at the Society of Arts under the Howard Trust. Also Dr. Percy F. Frankland, Professor of Chemistry, well known for his researches on bacteriology and on the chemical aspects of fermentation; Mr. Ludwig Mond, F.I.C., whose process of recovering sulphur from alkali waste has brought him into great prominence; and Dr. Silvanus P. Thompson, Principal and Professor of Physics in the City and Guilds of London Technical College, Finsbury, and distinguished for his acquaintance with the science of electricity, more particularly in its experimental and technical aspects.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 910.)

FOREIGN affairs have been the pivot upon which business in the Stock Exchange and in the Money Market has mostly turned during the past week; and the relations of the Autocrat of all the Russias with the Autocrat of all the Roubles have almost engrossed attention. All departments were pretty well influenced by the Foreign Market, and suffered general depression. The raising of the Bank of England rate on Thursday to 4 per cent., from the 3½ per cent. at which it had stood since the 16th of April, had the effect of checking to an extent the run on gold, and gave things a healthier tone. The Gas Market recovered somewhat from the inactivity it had displayed the week before; and business was fairly well up to the average. With one or two insignificant exceptions, changes in quotation, though few in number, are for the better; and firmness is the general characteristic all round. The Metropolitan Companies have been well to the front. Gaslight "A" continues remarkably steady. After being done every day at 243, it wound up with a closing mark ½ better. The debenture, preference, and limited issues have been very brisk at middling figures; and all the 10 per cents moved up 2. Business marked in South Metropolitan showed good prices; but quotations closed unchanged. In Commercials, one bargain in the old stock was the only job recorded; but both issues have advanced. A very little was done in Brentford and British; but otherwise the Suburban and Provincial undertakings made no sign. Among the Foreign division, Continental Union, fully paid, is ½ higher. The part-paid shares are temporarily withdrawn from quotation pending payment in full—an operation which is rendered necessary, owing to the difficulty experienced in adjusting the scale of voting power. Imperial Continentals are quiet and steady. Malta and Mediterranean have fallen another ¼; and Bahia has lost the improvement it made the week before. The other undertakings offered no remarkable feature. Among the Water Companies, there is an almost general recovery, partially recouping the losses of recent weeks; and quotations are from 1 to 5 per cent. higher. Southwark, however, takes its own line, and recedes 2½.

The daily operations were: Gas opened firm on Monday, and continued very steady, although business was rather limited. Continental Union rose ½; but Malta fell ¼. Water was very quiet, but disposed to improve; and East London rose 2. Gas was a little more active on Tuesday; and quotations underwent no change. Water also was unchanged. On Wednesday, the only feature in the Gas Market was an advance of 2 in Commercial old, and 3 in ditto new. Water was more active, and in better odour. Chelsea, New River, and West Middlesex rose 5 each; and Grand Junction and Lambeth, 1 each. The wide quotation of Southwark shrank closer—losing ¼. Gas was quiet on Thursday, and unchanged. Water continued to improve—Kent advancing 5; East London, 2; Grand Junction, 1. Business in Gas was much more active on Friday, especially in Gaslight issues. The 10 per cents. rose 2. Bahia fell back ½. Water received a check; New River being put back 5. Southwark receded 2. Business in Gas was good on Saturday; and the prices realized throughout were well above the average, but quotations did not move. Water also was unchanged.

ELECTRIC LIGHTING MEMORANDA.

The Difficulty of Making Electric Lighting Stations Pay—The Distribution of Power by Electric Light Undertakings—A New Primary Battery—The Naval Exhibition.

THE difficulty of arranging central station electric lighting plant in such a manner as to meet the irregular and fluctuating demand, is the most serious of all the problems of contemporary electric light engineering. The smallness of what Mr. R. E. Crompton calls the load factor of this class of plant, is the great obstacle in the way of making a profit. The variation of the load is of two kinds—seasonable and diurnal; and although gas undertakings experience the same thing, it does not affect them so seriously. In the case of a gas-works, the maximum production and the maximum demand occur together, and only last for a short season. There is thus plenty of time for repairs and renewals, and for getting up stocks. In the case of an electric light plant, on the other hand, the maximum demand occurs every day; and the only difference due to the seasons is that in the depth of winter the maximum demand lasts longer every day than it does in summer. But the controlling datum is the fact that if an electric lighting plant is wired (say) for 50,000 lamps in a residential district, all those lamps will want current during some part of the day, as well in summer as in winter; and since there is no storeage worthy of the name, all the generating plant must be set to work when required, if even only for an hour a day. What this means in the case of steam machinery, needs no explanation. Some of the statutory companies endeavour to save themselves as much expense as possible by not supplying current during the daytime in summer; but this course must lead to trouble as the business extends. Thus, last week a London Magistrate granted a summons against a West-end electric light company for refusing to supply a consumer whose business required the light

during the daytime. The refusal was wilful; and in all likelihood the incident will be made the occasion for an authoritative reminder that statutory obligations must not be ignored on account of manufacturing exigencies.

It was one of the principal points of Mr. Gisbert Kapp's recent Society of Arts Cantor Lectures, that if electric lighting companies could but get up a business in supplying motive power, they would be able to do very much better commercially than they are likely to do with lighting alone. He referred to the same considerations as we have just discussed with reference to the diurnal variation of the lighting load. The position is this: In a central station, wherever situated, the load due to the lighting varies greatly. During a few hours in the evening, the station will probably be worked up to its full capacity; and then the production of electrical energy will be very economical, as all the capital outlay will be actively employed, and also the efficiency of the plant is greater when doing full work than when running light. During the early morning, the load on a station may not be more than 10 per cent. of its full capacity; and in the daytime the output is very small. Now, if during these hours of minimum demand the plant could be run at its full capacity, and the surplus energy distributed to electro-motors, the working expenses would be only slightly increased, while the income of the station would be largely augmented. But here the question of cost—the electricians' bugbear—again crops up. Mr. Kapp is not likely to say anything more than he can help against electricity; but he admits that in cases where motive power is required continuously, it would not pay a manufacturer to use it in preference to gas or steam power, unless it could be supplied at less than 3d. per unit. Seeing that the charge in London is more than double this rate, it is difficult to see how the companies could develop a demand for power supplies, unless they were to sell current for this purpose at less than cost price. It must also be remembered that a large subscription for power would not always be a benefit to a lighting company, because in foggy weather and during winter afternoons the two classes of business would be apt to seriously interfere with one another.

M. de Meritens has come forward to break the silence that has for so long been kept by the French school of electricians, and has preferred a claim to have invented that economical primary battery which has been promised so often, and has never yet taken tangible shape. A meeting of electricians of all nations was recently held in the hall of the French Geographical Society, to hear M. de Meritens lecture on his great discovery, which is, of course, to disestablish the dynamo, and to make electric lighting as cheap as gas, if not cheaper. It is true that the battery consumes zinc, which is dearer than coal and not nearly so efficient; but the inventor declares that metallic zinc can be recovered from the residual product of the working of the battery, by a new method discovered by himself, at the trifling cost of 8c. or 10c. per kilogramme. The cost of recovery, therefore, with one or two other items, represents the cost of the battery working, and is sufficiently low, according to M. de Meritens, to render possible the industrial use of electricity as a source of motive power. This, of course, is the estimate of an electrician and a Frenchman; and, without disrespect be it said, the day for placing implicit confidence in electricians, even when of less sanguine blood, is past. We shall believe in M. de Meritens' economical zinc-consuming battery when it has been in operation for a few months in half-a-dozen different factories; but not before.

The opening of the Naval Exhibition in Chelsea is an event that calls for mention here for two reasons. In the first place, because electricity is conspicuously present in the great lighthouse model, which has a magnificent lantern that flashes afar, in a concentrated beam, the most powerful light ever yet placed in such a position. Secondly, electricity is conspicuous for its absence from the decorative lighting of the grounds, which is done by Messrs. Pain, the well-known pyrotechnists and illuminations contractors, with the old-fashioned, but still effective, coloured lamps. The fact of the matter is that the exhibition authorities cannot afford to pay electric lighting contractors tens of thousands of pounds for decorations that can be done by simpler means for a tenth of the cost, or even less. The electric lighting of the South Kensington series of exhibitions ran away with most of the profit of these popular displays; but the electricians will never have similar chances again, unless they can show a great reduction in their prices. The fact that electric lighting, as a decorative agency, has been dropped by the Naval Exhibition authorities, is something to make electricians ponder.

A Windfall for a Gas Company's Officials.—By his will, Mr. W. Cromond, of Derby, who died on the 31st of March, leaving a personalty of more than £140,000, has bequeathed £400 each to the Secretary and the Manager of the Derby Gaslight and Coke Company.

Institution of Civil Engineers.—Among the associate members of this Institution who were elected at the monthly ballot last Tuesday were Mr. W. Wythers Gray, Manager of the Cambridge University and Town Water Company's works, as well as those of the Trowbridge Water Company; and Mr. E. L. Mansergh, son of Mr. James Mansergh, M. Inst. C.E.

WILLIAM RICHARDSON.

In the course of the last few months, we have had to record the removal by death of several gentlemen who have occupied conspicuous positions in the gas world, and who constituted connecting-links, so to speak, between the present and the past of the industry with which they had been identified. We have now to announce the decease of one who, in every respect, was entitled to be classed in this category—namely, the venerable gentleman whose name stands at the head of this article, who passed away last Wednesday, at his residence in Birmingham, at the advanced age of ninety-five. As this event brought to a close a life which had run concurrently with the introduction and development of gas as an artificial illuminant, we reproduce from a long obituary notice which appeared in a local paper, the following particulars as to Mr. Richardson's interesting career.

William Richardson was born in Birmingham in the year 1797, about the time when Murdoch was conducting at the Soho Works his famous experiments in gas lighting. One of his earliest recollections was that of being taken as a child to witness the illumination of the works in 1802, in celebration of the Peace of Amiens. He had a most retentive memory, which remained unimpaired almost to the last. After considerably more than eighty years, he still retained a lively remembrance of the long range of gas-jets, some of which were suddenly extinguished by the wind, and as suddenly again re-lighted; and of the thousands of people who gazed at the new light which was to illumine the world as it had never been artificially illumined before. Young Richardson was educated at the neighbouring town of Coventry; and it was intended that he should be brought up to the watch trade. This occupation, however, proved far too monotonous to one possessing so much native energy and enterprise; and he was therefore transferred to a millwright's shop, where he gained an elementary knowledge of mechanics, which proved of infinite value in his after-career. While thus engaged, his curiosity was fired by the reports which reached him of the wonderful new artificial light which was being obtained from coal, and which it was asserted was attended with so much danger as to prevent it ever being generally employed. The secret of its production was preserved with great care, but not with sufficient success to prevent the inquiring spirit of Richardson from gleaning some information about it. By dint of great perseverance, and after many unsuccessful trials, he succeeded in making a very small gas apparatus, which he exhibited in his own circle with pardonable pleasure and pride. In 1817, Mr. Gosling, of London, contracted to erect the works for supplying Birmingham with gas; Clegg being the Consulting Engineer. An opportunity was now afforded to young Richardson of acquiring the knowledge for which he so ardently sought. Having attained some skill as a millwright, he secured from the contractor an engagement to fit up the various appliances. Continuing at the works for some time after their completion, he acquired an insight into the best-known methods of producing coal gas. Some years later, on the completion of the gas-works at Wolverhampton (which were erected by John Grafton), where the first clay retorts were used, Mr. Richardson, who was then about twenty-two years of age, became Manager, which position he held for about two years. It is an interesting fact that the first public lamp in Wolverhampton was put up by Mr. Richardson for Mr. Richard Fryer, a banker of the town. In 1822 he was appointed Superintendent and Resident Engineer of the Wigan Gas Company's works, which were about to be constructed by John Malam. While holding this appointment, he erected several gas-works in the immediate neighbourhood of Wigan. In spite of tempting offers to remain with the Company, he determined to resign the appointment, and extend his knowledge by investigations in London and other cities and towns where gas-works were erected. In this way he made the acquaintance of many of the leading gas engineers of the day—among them being Peckston and George Lowe. In 1826, having by that time acquired a considerable reputation both as a financier and a manager, he entered into a contract to conduct the business of the Dudley Gas Company. He established in that town a manufactory for all the various appliances required in the works, and took contracts for constructing works; and for a period of about thirty years he carried on an extensive business. While residing at Dudley, he assisted in establishing the old Dudley Water-Works, of which he was the Manager for about a quarter of a century. In 1858 he left Dudley, and removed to Rhyl, where, however, he found a life of retirement little suited to his taste. Consequently, he soon embarked in the business of establishing gas and water works in several towns in Wales during the four years of his stay there. In 1862 he decided to remove to Birmingham; and there he founded an engineering depôt in Charles Henry Street. But he principally occupied himself in inspecting and reporting on various gas and water works in different parts of the country. Mr. Richardson was a widower; his wife having died in 1884, at the advanced age of eighty. He leaves behind him two children—a son (who carries on the foundry in Birmingham) and a daughter.

COMMUNICATED ARTICLE.

THE STANDARD OF LIGHT.

By Walter Grafton, of The Gaslight and Coke Company, Beckton.

(*Concluded from p.* 791.)

I have now to deal with the results obtained with the various photometers and candles used in the experiments, as set out in the accompanying tables.

Table I.—The figures in this table are very interesting, and are the mean results of the experiments made in each photometer—the total number being 1101. The experiments made by "natural bend" and "quarter bend" were in accordance with the Referees' Instructions, and are thereby parliamentary tests. In all cases they show that the photometer does not materially affect the difference, although in the new forms of photometers (which are open) there is a more marked divergence between the results. The differences are very satisfactory; since, if we compare the calculated amount of light developed by candles having their wicks in various positions, the "quarter bend" results are all (with but one exception, which is 1·07 per cent. above) within 1 per cent. of the mean, yet a mean development of 6·6 per cent. above the "natural bend" results. This high development then means that, by using candles having "quarter bend" wicks, a loss of more than one candle in estimating the quality of a gas is the result. The consumption of sperm in both cases is practically the same. The figures under "half bend" only go to show that candles having this curvature are better for the gas than "quarter bend," although consuming a high rate of sperm; but if we could ensure that in this all the sperm was burnt to the best advantage, no doubt a different aspect would present itself in these figures. The method of consuming the sperm is unsatisfactory, and could never be accepted. The figures obtained by having an "upright" wick are remarkable, considering the near approximation in the consumption of sperm to the first two curves. The sperm here is all burnt, but not to the best advantage; and the effect in the estimation of the quality of a gas is a gain equal to 20 per cent. on a 17-candle gas. The figures obtained by actual experiment of the light developed by candles, are the results of 40 experiments; and they accord very well with the calculated figures.

Diagram E.

All the above experiments were made with Miller's "3-23-20" candles, now extinct. The 3-23-20 signifies that each candle wick was made up of 3 strands of 23 threads each, plaited under a tension of 20, which represents the degree of tightness of plait. The standard candle has recently been altered, with a view to

Table I.

Closed Evans Photometer (100-inch Bar).

Natural Bend. Illuminating Power, corrected.	Natural Bend. Consumption of Sperm by Two Candles in Ten Minutes. Grains.	Quarter Bend. Illuminating Power, corrected.	Quarter Bend. Consumption of Sperm by Two Candles in Ten Minutes. Grains.	Half Bend. Illuminating Power, corrected.	Half Bend. Consumption of Sperm by Two Candles in Ten Minutes. Grains.	Upright. Illuminating Power, corrected.	Upright. Consumption of Sperm by Two Candles in Ten Minutes. Grains.
16·867	40·203	15·947	40·416	16·520	45·633	20·545	40·247
Improved Evans Photometer (60-inch Bar).							
16·612	39·679	15·689	39·734	—	—	19·890	39·700
Imperial Photometer (60-inch Bar)							
17·390	40·425	16·380	41·565	—	—	21·050	40·269
Letheby Photometer (60-inch Bar), Tooley Street Pattern.							
16·388	39·820	15·252	40·320	15·420	43·600	19·776	39·476
Letheby Photometer (60-inch Bar), Lambeth Road Pattern.							
17·231	40·155	15·990	40·187	16·340	43·300	20·022	41·422
Aggregate of Photometers.							
16·897	40·056	15·851	40·444	16·093	44·177	20·256	40·220

Light emitted by each Candle per 120 Grains of Sperm when the Wicks are in different Curvatures, calculated from Natural Bend Results, assuming that they were obtained by 1 Candle.

	Natural Bend. Light in Candles.	Quarter Bend. Light in Candles.	Half Bend. Light in Candles.	Upright. Light in Candles.
	1·000	1·0576	1·0210	0·8209
	1·000	1·0588	—	0·8352
	1·000	1·0616	—	0·8261
	1·000	1·0745	1·0627	0·8286
	1·000	1·0775	1·0544	0·8606
Aggregate	1·000	1·0660	1·0460	0·8341

Actual Light emitted by each Candle per 120 Grains of Sperm, uncorrected for High Power of Standard (average of 40 Experiments).

Natural Bend. Light in Candles.	Natural Bend. Consumption of Sperm in Ten Minutes. Grains.	Quarter Bend. Light in Candles.	Quarter Bend. Consumption of Sperm in Ten Minutes. Grains.	Half Bend. Light in Candles.	Half Bend. Consumption of Sperm in Ten Minutes. Grains.	Upright. Light in Candles.	Upright. Consumption of Sperm in Ten Minutes. Grains.
0·9823	39·7	1·0255	41·0	1·0229	43·8	0·8298	40·36

Table II.

Improved Evans Photometer (60-inch Bar).

Date when Finished.	Number of Experiments Made.	Natural Bend. Illuminating Power, corrected. Candles.	Natural Bend. Consumption of Sperm by Two Candles in Ten Minutes. Grains.	Quarter Bend. Illuminating Power, corrected. Candles.	Quarter Bend. Consumption of Sperm by Two Candles in Ten Minutes. Grains.	Calculated Development of Light by Quarter Bend over Natural Bend. Candles.	Class of Candles used.
Nov. 11, 1890	81	16·848	41·39	15·734	41·49	0·0708	3-18-18
" "	75	16·834	40·11	15·840	40·37	0·0627	3-23-20
Letheby Photometer (60-inch Bar), Tooley Street Pattern.							
" 12 "	66	16·380	41·08	15·333	41·68	0·0684	3-18-18
Improved Evans Photometer (60-inch Bar).							
" 31 "	76	16·701	41·71	15·653	41·17	0·0669	3-18-18

Percentage number of experiments which burnt too fast, and consequently were outside limits: First series, 27 outside, 73 inside; second series, 100 inside; third series, 21·2 outside, 78·8 inside; fourth series, 15·8 outside, 84·2 inside.

Table III.

Tests burning within the Limits, compared with those which were made to Burn at a High Rate of Consumption of Sperm (Improved Evans Photometer, with 60-inch Bar.)

No. of Experiments Made in each case.	Natural Bend. Illuminating Power, corrected. Candles.	Natural Bend. Consumption of Sperm in Ten Minutes. Grains.	Natural Bend. Illuminating Power, corrected. Candles.	Natural Bend. Consumption of Sperm in Ten Minutes. Grains.	Quarter Bend. Illuminating Power, corrected. Candles.	Quarter Bend. Consumption of Sperm in Ten Minutes. Grains.
15	16·982	49·96	16·925	48·99	16·212	50·27
Light Developed per Grain of Sperm Consumed.						
—	0·00883	—	0·00836	—	0·00873	—

increase the consumption of sperm, to 3-18-18. This wick is looser, but ought not to have been, since it contains 15 threads less than the former standard candle wick. It is less rigid; consequently, it requires longer time to attain to the curvature of 3-23-20 wick, as diagram A (*ante*, p. 790). Should there be any spiral action in the wick, due to it not being kept straight when the candle was made (see diagram E, which represents three candles of this kind indiscriminately taken, and allowed to burn 1¼ hours), it will never be right; and, if used in making a testing, it will not give to the opposing light its true quality, but considerably less than it is. The 3-23-20 candles were very satisfactory; and if any improvement need be made to increase the consumption, 3-21-20 or 3-23-19 would answer the purpose. But 3-18-18 certainly will not do, as they have many faults, which it is not the object of these articles to raise. Although the intention in altering the candle was to increase the capillary attraction, care ought to have been taken, in doing so, not to weaken the wick, as the present alteration has done.

Table II.—In this table will be found the results of a few experiments made with 3-18-18 candles compared with those made with 3-23-20 candles in an improved Evans photometer. The writer was unable to make an equal number of experiments with each class of candles, owing to the 3-23-20 candles being used up. A few also were made with 3-18-18 candles alone in a 60-inch Letheby photometer, and again in another improved Evans photometer. In many cases it was necessary to give the 3-18-18 wick the "natural bend;" and after allowing a few minutes, a test was made. The results by 3-18-18 and 3-23-20

TABLE IV.

Two Candles (Miller's 3-24 —) specially made.

Date, 1890.	No. of Candle.	Time Allowed before Starting. Minutes.	Quarter Bend. Illuminating Power, corrected.	Quarter Bend. Consumption of Sperm in Ten Minutes. Grains.	Time Candles had been burning. Minutes.	Natural Bend. Illuminating Power, corrected.	Natural Bend. Consumption of Sperm in Ten Minutes. Grains.	Time Candles had been Burning. Minutes.	Natural Bend. Illuminating Power, corrected.	Natural Bend. Consumption of Sperm in Ten Minutes. Grains.
Oct. 29	I.	14	16·63	43·3	25	17·75	42·6	—	—	—
,,	II.	12	15·56	40·5	22½	16·53	40·5	33*	16·99†	40·5
,,	,,	13	15·68	42·8	23½	16·41	41·2	34	16·80	41·7
30	,,	11	15·85	41·2	21½	16·47	40·3	32½	16·74	39·9
,,	,,	15½	15·67	41·3	26	16·35	41·0	—	—	—
31	,,	12	16·40	42·4	24	17·30	41·6	—	—	—
Mean . . .		13	15·96 (*a*)	41·9	23¾	16·80 (*b*)	41·2	33	16·84 (*c*)	40·7

Calculated mean amount of light developed by candles: (*a*) 2·1278; (*b*) 2·0214; (*c*) 2·0166.

* Another experiment was made with the candles burning, with the "natural bend," for 44 minutes, with the following results: Illuminating power corrected, 16·98 candles; consumption of sperm in ten minutes, 39·5 grains. The calculated amount of light developed by the candles gave a mean of 2.

† Better quality of gas.

Actual Light developed by Candles in Open Room.

Date, 1890.	No. of Candle.	Time Allowed to Burn before Starting. Minutes.	Quarter Bend. Light in Candles.	Quarter Bend. Consumption of Sperm in Ten Minutes. Grains.	Time Candles had been Burning. Minutes.	Natural Bend. Light in Candles.	Natural Bend. Consumption of Sperm in Ten Minutes. Grains.	Time Candles had been Burning. Minutes.	Natural Bend. Light in Candles.	Natural Bend. Consumption of Sperm in Ten Minutes. Grains.
Oct. 30	II.	14	2·1316	43·1	24½	2·0228	43·1	35	1·9840	43·0
31	I.	13½	2·1522	42·3	24	2·0394	42·3	35	2·0016	41·5
Mean . . .		13¾	2·1418	42·7	24¼	2·0310	42·7	35	1·9928	42·2

4 Experiments made in improved Evans photometer in one place.
7 ,, ,, ,, ,, second place.
5 ,, ,, Letheby photometer in third place.
6 ,, ,, open room.
22 ,, ,, with the two candles.

TABLE V.

Two Candles (Miller's 3-26-24) specially made.

Date, 1890.	No. of Candle.	Time Allowed before Starting. Minutes.	Quarter Bend. Illuminating Power, corrected.	Quarter Bend. Consumption of Sperm in Ten Minutes. Grains.	Time Candles had been Burning. Minutes.	Natural Bend. Illuminating Power, corrected.	Natural Bend. Consumption of Sperm in Ten Minutes. Grains.	Time Candles had been Burning. Minutes.	Natural Bend. Illuminating Power, corrected.	Natural Bend. Consumption of Sperm in Ten Minutes. Grains.
Oct. 29	I.	12	16·42	41·7	22	16·92	40·3	—	—	—
,,	II.	12	15·73	41·4	22½	16·51	40·1	34	16·67	40·7
30	,,	14	16·75	43·6	25	17·76	42·0	—	—	—
,,	,,	13	16·11	40·9	23½	17·44	40·7	34	17·64	41·0
,,	I.	14	15·37	41·6	24½	16·18	41·1	35	16·83*	39·0
,,	,,	11	15·96	40·7	21½	16·65	40·9	—	—	—
31	II.	13	15·59	40·7	24	16·72	41·5	—	—	—
,,	I.	16	15·96	40·8	27	17·06	40·5	—	—	—
,,	II.	15	16·39	40·7	26	17·20	41·8	—	—	—
Mean . . .		13½	16·03 (*a*)	41·3	24	16·94 (*b*)	41·0	34½	17·04 (*c*)	40·2

Calculated mean amount of light developed by candles: (*a*) 2·126; (*b*) 2·0118; (*c*) 2. * Better quality of gas.

Actual Light developed by Candles in Open Room.

Date, 1890.	No. of Candle.	Time Allowed to Burn before Starting. Minutes.	Quarter Bend. Light in Candles.	Quarter Bend. Consumption of Sperm in Ten Minutes. Grains.	Time Candles had been Burning. Minutes.	Natural Bend. Light in Candles.	Natural Bend. Consumption of Sperm in Ten Minutes. Grains.	Time Candles had been Burning. Minutes.	Natural Bend. Light in Candles.	Natural Bend. Consumption of Sperm in Ten Minutes. Grains.
Oct. 30	II.	14	2·1272	40·7	25	2·0348	42·0	35½	2·0248	42·8
31	I.	13	2·1126	42·0	23½	2·0748	40·7	34	2·0382	42·0
Mean . . .		13½	2·1200	41·3	24¼	2·0548	41·4	35	2·0314	42·4

5 Experiments made in improved Evans photometer in one place.
11 ,, ,, ,, ,, second place.
5 ,, ,, Letheby photometer in third place.
6 ,, ,, open room.
27 ,, ,, with the two candles.

candles agree; while the "quarter bend" results are a little lower by using 3-18-18 candles. The calculated light developed by 3-23-20 candles agrees with my former experiments; while the 3-18-18 candles show a little increase. In the same table is shown the percentage of candles which consumed too much sperm. None, however, consumed too little.

Table III.—The experiments, of which the results are given in this table, were made to see if any advantage was to be gained by consuming high rates of sperm. The candles were lighted in the usual way, and allowed sufficient time to get right before proceeding with a test. After making a test which may be represented by the average in the first column, the wicks were made looser without extinguishing the glowing ends, and the curvatures left as before. Some of the sperm goes off in the form of smoke; otherwise the result of making a test with these candles would be less than it is. Such a test is represented by the average in the second column. The tests represented by the average in the third column were conducted in the same way; but the wicks were given the "quarter bend" curvatures. The results, then, by these methods show that no advantage is to be derived by consuming high rates of sperm when the wicks have the "natural-bend," and only a little is gained by using "quarter bend," and then it only accrues from burning extremely high rates of sperm.

Table IV.—The experiments, of which the details are given in this table, were made with specially-prepared candles, the wicks of which contained 72 threads; the degree of tightness not being known. The tests were made in series in four different photometers; consequently, they must not be compared vertically. A few have burnt more than 126 grains of sperm per hour, which can be accounted for; yet the results are satisfactory. It is not advisable to record tests which have burned outside the limits laid down; but the candles being limited, all tests made are given. "Natural bend" tests were repeated two and three times at intervals of about a minute, as shown; giving very concordant results. These were not made on a constant quality of gas, which partly accounts for some of the variation.

Table V.—These experiments are similar in every respect to those in the preceding table, and were also made with two specially-prepared candles, each containing a 3-26-24 wick. There was no difficulty with the curvatures of the wicks, and each class of candle behaved well. Clear-glowing ends and neatly-shaped unspiral wicks were very conspicuous; in fact, they were all that could be desired. The figures in both tables speak very much in favour of the "natural-bend," and are very corroborative.

In summing up this mass of evidence and proof of constancy in the candle when properly used, it is clear that the standard candle, in order to be actually a standard, must be confined to treatment which in no way interferes with the normal burning of the sperm. The figures given show most prominently that curvature is of more importance than size of wick.

The definition of the standard should embrace not only consuming as nearly as possible 120 grains per hour, and of six to the pound, but the wick to contain a fixed number of threads plaited to a fixed degree of tightness; to be straight throughout the sperm; and to contain a specified curvature. Then, and only then, shall we have what may fairly be called a standard candle. The Referees' Notification should contain a diagram of the candle, showing the curvature of the wick, which would be a very desirable addition. Diagrams are given especially of the standard burner, which is elaborately detailed; and why not that of the standard candle? It may be said that no two operators would have the same degree of curvature; but a degree either one way or the other would not affect the result by more than 0·1 candle.

Mr. J. Booth, Engineer and Manager of the Southport Corporation Gas-Works, has been suffering from a severe attack of influenza; but his numerous professional friends will be pleased to learn that he is now somewhat better, and hopes shortly to resume his duties.

Working Exhausters with Gas-Engines.—A correspondent who is desirous of driving an exhauster with a gas-engine, would be pleased to have information on the subject. We shall therefore be obliged if any of our readers who may be running an exhauster in this way, with works making about 7 millions per annum, will communicate to us the results of their experience.

The Use of Oxygen in Generating Producer Gas.—Referring to the paragraph in the JOURNAL for the 28th ult. in which Mr. F. J. Jones, of Bedford, claimed the right to use pure oxygen in generating producer gas, Mr. B. H. Thwaite, of Liverpool, says perhaps Mr. Jones has not seen the specification of his (Mr. Thwaite's) patent, No. 15,621 of 1886, wherein the use of pure oxygen, produced by the Brin process, for making generator gas free from nitrogen, is specified.

Mr. J. Birch Paddon.—In noticing last week the appointment of Mr. J. Birch Paddon, M. Inst. C.E., as a Director of The Gaslight and Coke Company, in place of the late Mr. Stephenson Clarke, we inadvertently stated that he was Consulting Engineer of the Brighton and Hove Gas Company. Mr. Paddon is now a Director of that Company; and it might have been mentioned that he is also Chairman of the Colney Hatch, Lea Bridge District, and Malta and Mediterranean Gas Companies.

TECHNICAL RECORD.

THE BUENOS AYRES CO-OPERATIVE GAS-WORKS.

Continuing from the two preceding issues of the JOURNAL our description of the above-named works, we have to deal to-day with the apparatus and ironwork.

The contract for the apparatus and ironwork comprised the following plant: (1) Ironwork for roofs of the retort-house, coal-store, purifying-shed, engine and boiler house, sulphate of ammonia factory, and meter and governor house; including columns and girders, gutters, and rain-water pipes. (2) Fittings for 256 retorts; including hydraulic mains, ascension-pipes, mouthpieces, collecting-mains, tar syphons and outfalls, furnace doors, and floor staging. (3) One annular condenser, and two tower scrubbers, with connecting-pipes and valves. (4) Four sets of exhausters and engines, with connections; three boilers, with fittings; and pumps, with special engine, together with pipes and fittings. (5) Four purifiers, with valves, connections, and lifting apparatus. (6) Two telescopic gasholders, with cast-iron tanks and appendages. (7) One station meter and two governors, with valves, connections, and fittings. (8) Water-tank and tar-service tank, with supports; water-service tanks for retort-house; syphon-seal box, with connections; and four cast-iron chimney caps. (9) Connecting-pipes on works, including water service pipes and fittings. (10) Sundry castings and fittings, consisting of balconies, railings, gates, &c.

The whole of the work contracted for was to be delivered and erected and painted at the contractor's entire expense, and in complete and perfect working order, and in accordance with the detailed descriptions contained in the specifications, and with the plans and drawings supplied to the contractor.

Retort-House Roof.

The retort-house roof, of which the cross section and details are shown on the plate which accompanies the present issue of the JOURNAL, was constructed of elliptical lattice-girder principals, tied together by longitudinal Warren girders supporting T-iron rafters. The following extract from the specification more fully describes this roof:—

The roof of retort-house is to be 70 feet span and 214 ft. 8 in. long, and to have twelve principal rafters of curved lattice-girder form, braced together by eight rows of longitudinal Warren girders, and supporting a series of secondary rafters with purlins and ventilator.

Principals.—The principals to be 16 ft. 8 in. apart from centre to centre. The central portion of them to be curved to a radius of 43 ft. 6 in. and to be 1 ft. 6 in. deep; the ends to be elliptical, and tapering in depth from 2 ft. at the haunches to 1 ft. 6 in. where they join the central portion. The principals to be supported on brackets to be hereafter described, and to rise 23ft. in the centre. The top and bottom plates of the girders to be 8 in. wide by $\frac{3}{8}$ in. thick; the angle-irons, 3 in. by 3 in. by $\frac{3}{8}$ in.; and the lattice bars, $2\frac{1}{2}$ in. by $\frac{3}{8}$ in. flat iron. The girders to be in five pieces; the joint-cover plates to be 2 ft. 4 in. long by $\frac{3}{8}$ in. thick; and the angle-iron junction pieces $2\frac{1}{2}$ in. by $2\frac{1}{2}$ in. by $\frac{3}{8}$ in., and 1 ft. 6 in. long, riveted with six $\frac{3}{4}$-inch rivets. The top and bottom plates to be riveted to the angle-irons with $\frac{3}{4}$-inch rivets, 4 inch pitch. At the haunches, the girders shall have solid plates $\frac{3}{8}$ inch thick in place of lattice bars; and shall terminate with angle plates and base plates $\frac{1}{2}$ inch thick. At the junction of the longitudinal girders there shall be $\frac{3}{8}$ inch solid plates, 1 ft. wide, inserted in the principals. The ends of the principals to be furnished with eight bolts 1 inch in diameter, to secure them to the wall brackets.

Brackets and Holding-Down Bolts.—The brackets to be of cast iron, made in the form and manner shown in the drawing, and having ornamental side plates attached by countersunk set-screws. The brackets to be built into the wall-piers of the retort-house, and secured by four bolts $1\frac{1}{8}$ inches in diameter and 4 ft. 6 in. long, having at the lower end anchor-plates of cast-iron 2 ft. 6 in. long, 2 ft. wide, and $1\frac{1}{4}$ in. thick.

Longitudinal Girders.—The longitudinal girders shall be of the Warren type 1 ft. 2 in. deep, and made of one top T-iron 6 in. by 3 in. by $\frac{1}{2}$ in., and one bottom T-iron 3 in. by 3 in. by $\frac{1}{2}$ in., with bars of $2\frac{1}{2}$ in. by $\frac{3}{8}$ in. flat iron. The ends of the girders to have $\frac{1}{2}$-inch angle plates, and to be bolted to the principals with six 1-inch bolts at each end.

The straight rafters of 4 in. by $\frac{1}{2}$ in. T-iron were supported by cast-iron chairs fixed to the principals and girders. The ventilator is 13 feet wide, and the chimneys pass through it. Its rafters are of 3 in. by 3 in. by $\frac{1}{2}$ in. T-iron.

Roofs of Coal-Store and Purifying-Shed.

These are ordinary trussed roofs, in two spans; the roof of the coal-store being 34 feet, and trussed with one strut on either side of each rafter, and that of the purifying-shed being 44 feet span, the rafters having two struts on either side. These roofs are carried on double lattice girders in the centre, supported by cast-iron columns. The columns are attached by bolts to separate cast-iron hollow bases, some of which possess outlet-pipes 6 inches in diameter, by which the rain water is carried off through the columns from the central gutter. These sheds, as well as all the other buildings, except the retort-house, are 20 feet high to the spring of the rafters.

MODERN COAL GAS MANUFACTURE.

At the Meeting of the Society of Engineers at the Town Hall, Westminster, yesterday week, as briefly recorded in the last issue of the JOURNAL, Mr. C. C. CARPENTER, Assoc. M. Inst. C.E., of the Vauxhall Station of the South Metropolitan Gas Company, read a paper on the above subject, of which the following is an abstract.

In commencing the paper, Mr. Carpenter said that, if any apology were needed for reading a paper on this subject before the Society, he ventured to hope it might be found to some extent in the fact that, beyond the circle of the interested, but scant information thereon appeared to exist among the engineering profession as a whole; and he called attention to the magnitude of the industry by mentioning that upwards of 10 million tons of raw material were carbonized annually for gas-making purposes in the United Kingdom. The author then proceeded to describe, in their natural order, the manufacturing operations and the plant employed in each department.

In dealing with the subject of carbonizing, he said that the disadvantages of the circular form of retort were manifest, when it was remembered that the surrounding heat had to penetrate to the centre of the contained mass of coal, in order to drive off its volatile constituents; and, as might be expected, it was generally found in working that the core of the otherwise burnt-off charge consisted of only partially carbonized coal. Both ⌂ and oval retorts were free from this serious defect; and theoretically, as well as in the opinion of the majority of engineers, of the two the ⌂ had the advantage. The author's experience of oval retorts on the large scale, as compared with that of other engineers working under precisely similar conditions with ⌂ retorts, had convinced him that the supposed advantage of the latter was an imaginary one, and that no increase in quality or make of gas per ton could be placed to their credit. Further than this, they were more difficult to draw. A stoker would take half as long again to draw one clean as compared with an oval; while they were obviously not so strong nor so suited to resist wear and tear, being inherently weak at the corners. Besides this, the self-sealing lids were more difficult to keep tight; and the shape of the mouthpiece did not lend itself so well to the best disposition of the curved pipes (or ascension bends) conveying the gas from the retorts. The author had now at work gas-fired oval clay retorts which had been in use (with yearly letting down) for 1600 working days under modern conditions of production—a record which had probably been neither exceeded nor equalled. Describing the heating of the retorts, he said that settings of "sixes" were most convenient in narrow arches, since they permitted of a large combustion chamber being used; but they were not the most economical in floor space or in fuel consumption. A setting of "sevens" was a much better arrangement where the retorts were placed almost equi-distant around the heating zone; and the course the waste gases had to take allowed as much as possible of their useful effects being absorbed before their exit to the flues. But a setting of seven with a centre retort was a bad, though not an uncommon, arrangement, as that retort was sure to be overheated if the others were kept up to their proper temperature, and this too in spite of the additional "shielding" which was necessary. The extra wear and tear induced thereby affected the stability of the other retorts placed round it; and its ascension-pipes gave more than the average trouble by stoppages. Almost the same remarks applied to settings of "eights." The author had known the lower centre middles to burn out regularly after six months' working; while the others in the bench were good for two seasons. The settings of "nines" were a very good type, provided sufficient room was left between each vertical tier of retorts to allow of proper combustion taking place. Settings of "tens" were useful and economical both as regarded floor space and fuel consumption. The great objection to them, however, lay in the fact that a secondary travelling charging floor or stage had to be provided from which to stoke them. As to the settings of "elevens," so far as the author was aware, the only works where these were in use was the Old Kent Road station of the South Metropolitan Gas Company. Their object was to reduce the waste in both labour and coke for heating which existed in settings of "sixes" and "sevens;" but developments in gaseous firing had rendered possible the attainment of these desirable ends by simpler means. Referring to single and through retorts, he said that the former deserved mention as they had been advocated by some as a preventive of stopped pipes. But his experience did not tend to confirm this belief; and the through system had many attendant disadvantages as regarded working.

The next section of the paper was devoted to retort heating and working. Having explained the system of working by direct-acting furnaces, the author alluded to gaseous firing. In Scotland, the Siemens outside producer, as improved by Mr. W. Foulis, was now largely used; but this did not appear to have met with much success where coke other than that from cannel or shale had to be used—the chief difficulty being in the maintenance of a constant supply of primary air under the ever-varying conditions of the hearth. The closed grate producer, in one or other of its forms, was now almost universally used. In 1888, the author introduced some modifications designed to reduce the initial outlay for erection, as well as to effect further economies in the cost of working. Instead of providing every setting with its own furnace, he placed four or five in communication with one gas-producing centre, arranged conveniently for feeding with fuel; the amount of gas going to each being controlled by a damper. Regenerators were dispensed with; the secondary air being heated to the required degree by its passage through a shallow flue formed on the floor of the setting. By this means, wear and tear had been largely reduced, and less labour was required for firing than was possible in any other plan. The arrangement was now in use in various parts of the country; but he did not recommend it for small works. In this connection, the author said that one important subject which was just at present engaging the serious attention of gas engineers deserved to be noticed—namely, the introduction of sloping retorts. The first patent for these was taken out nearly 20 years ago; but it had remained for a Frenchman—M. Coze—to put the idea into working shape. The retorts, instead of being placed horizontally, were set at an angle varying from 29° to 36°—the angle of repose of coal being within these limits. The charge was tipped in at the top end, and spread itself in an even layer over the bottom of the retort. When properly carbonized, the lower door was opened, and but a slight inducement was needed for the red-hot coke to run itself out. To obtain the fullest advantages of this most ingenious system, however, very considerable alterations would have to be made in the present methods of storing and supplying the coal.

In alluding to the means by which the crude gas was collected, Mr. Carpenter pointed out that the ascension-pipe should be as short as possible, so as to avoid any condensation therein, the effect of which was to increase its tendency to choke. The exhausters were next described; it being remarked that in the best designed modern practice, they were driven by compound condensing engines, the steam being raised in many cases by burning breeze—a fuel the London market value of which was at present under 2s. per ton. The gas as it left the exhauster had to be freed from the light tarry vapours which escaped condensation. The most effectual apparatus for this purpose with which the author was acquainted was the Livesey washer. How the ammonia and other soluble impurities associated therewith were extracted from the gas was next explained; and in describing the construction of tower scrubbers, the author stated that he had experienced considerable advantage from lagging the scrubbers internally to the extent of 4 or 5 inches in thickness. From the scrubbers the gas, charged with three important impurities—carbonic acid, sulphuretted hydrogen, and carbon bisulphide—passed on to the lime purifiers. Of these, the two former, and all but the last traces of the latter, had to be removed from the gas supplied in London; this process being known as sulphur purification. Formerly the most troublesome known to gas engineers, the process had been reduced to great simplicity. By the Metropolis Gas Act of 1860, it was required that not more than 20 grains of sulphur should be contained in 100 cubic feet of gas. This condition the Companies found themselves unable to comply with, with any degree of certainty; and the matter rested to a great extent in the hands of experts until the year of the coal famine in 1873. The Phœnix Gas Company then injudiciously raised their price 9d. per 1000 cubic feet at a bound; agitations everywhere ensued; and officials were appointed by the local authorities to test the gas for sulphur compounds, with the result that many excesses were found and prosecutions resulted.

These troubles led to investigations being made by many gas engineers and chemists; and the now well-known method of sulphur purification which was adopted as a consequence was described by the author. Experiments, however, had since proved that sulphur purification without oxygen was not practicable. This fact had long been known to Metropolitan engineers, who, by drawing regularly from ½ per cent. of air upwards, had been able to keep their boxes active when a series of four of them was worked in rotation. Owing to the improvements made in the production of oxygen by Messrs. Brin, Mr. W. A. Valon, the Engineer of the Ramsgate Gas-Works, had proposed its use, instead of air, for purification purposes; and the process had been employed at his and other works. Mr. Carpenter then described the best arrangement of purifying-houses as follows: The lime-boxes should stand on the first floor, as this allowed of barges, trucks, or carts being placed immediately underneath them, and greatly facilitated the discharge of the spent material without nuisance. The quicklime was lifted direct to the top floor above, slaked and stored there, and run down shoots into the boxes as required. Good examples of the above had, he said, been erected in London by Mr. John Methven and Mr. H. E. Jones. The oxide boxes should be on the ground level with revivifying floors above, to which the foul oxide might be lifted by steam or hydraulic hoists, spread out, and when ready for use tipped down the shoots in the same way as the lime. Speaking next of station meters, the author said he could not too strongly urge upon gas engineers the great importance of correcting their readings to a standard temperature and pressure, though 60° Fahr. was probably too high by some 8° or 10°.

The subject of gasholders formed a fitting conclusion to the paper. The construction of some of the earlier types of holders was described; and this was followed by a reference to the modern form of holder, which, the author remarked, might be

said to owe its inception to Mr. G. Livesey, and of which such fine examples had been designed by him. This was surrounded by a framing so constructed as to form a rigid cantilever, circular in plan, with the tank wall, to which it was securely bolted, for its base. The largest holder in the world was now being built for the East Greenwich works of the South Metropolitan Gas Company, at a cost of £42,000. It would have six lifts (the two inner ones rising clear above the guide-framing), and would contain when full more than 12 million cubic feet of gas. The author also mentioned the invention of Mr. Gadd for dispensing with the ordinary guide-framing; but, he said, this system of guiding the holder from its base, and at the same time preserving its stability against wind pressure, was one that could only be safely applied to small holders, and then, too, with questionable advantage.

At the close of the discussion which followed the paper, a hearty vote of thanks was passed to Mr. Carpenter.

OHIO GASLIGHT ASSOCIATION.

The Annual Meeting at Zanesville.

(*Continued from p.* 839.)

At the close of the proceedings already reported, Mr. Irvin Butterworth, of Columbus, read a paper entitled, "Does Ohio want a Gas Commission?" He said he had sent out a circular to the 79 gas companies in Ohio, and had received 47 replies. Of this number, those who sent 23 did not understand the working of a Commission; 17 were in favour of one more or less after the pattern of that in Massachusetts; and 4 were actually opposed to the proposition. The value of this testimony was greatly mitigated by the fact that many companies were not familiar with the working of the Massachusetts Commission, and therefore were not really in a position to say whether or not a similar one would benefit them. The question was rather "Does Ohio *need* a Gas Commission?" The majority of those who had studied the subject were in favour of it. Seeing that so many appeared to be ignorant, he included in his paper a compendium of the Massachusetts law, compiled by Mr. Allan R. Foote. This provides for the election of three Commissioners, each of whom holds office for three years. The Chairman is paid a salary of £600, and the other Commissioners £500 a year each; £200 per annum is allowed for expenses, and £400 for a clerk. Every gas and electric light company in the State makes a yearly return of its accounts according to a set form; and this includes a list of salaried officers, with the amount paid to each. The Commission also prescribes the forms of books to be used by the companies; and these are open to the inspection of the Commission at any time. Complaints as to the price or quality of gas can be made by the Mayor, the Alderman, or by any 20 customers; and after a public hearing, the Commission has power to make an order in either respect. Any person can complain to the Commission if a company will not supply him; and after an open enquiry the Commission can order them to do so on reasonable terms. No other undertaking can be established in competition with those already existing, without a consent from the Mayor and Alderman, given after a public hearing. The Commission also prescribe regulations for purity of gas, &c. They can grant powers to any existing gas company to take up the business of electric lighting, subject to the approval of two-thirds of the shareholders representing two-thirds of the stock; including either the erection of new plant or the buying up of existing electric light undertakings. On the application of either party concerned, any order previously made may be revised, after due investigation. Full particulars of accidents occurring at any works authorized are to be furnished to the Commissioners within 24 hours; and they have the right to inquire into the circumstances, if desirable. The expenses of the Commission are to be borne by the several undertakings concerned, in proportion to their gross earnings. These, with the usual legal stipulations, are the principal features of the Massachusetts gas law. General Hickenlooper some years ago suggested that any State Commission should comprise a representative of each of the three interests involved—the company, the municipality, and the public. The first should be appointed by the gas companies, the third by the governor, and the second should be the chief executive officer of the district concerned. There would thus be only two permanent officers, and they should receive liberal salaries, and hold office for not less than five years. They should have a fully-equipped department at the capital, and one of the State gas-works might be placed at their control for test and experimental purposes. These Gas Commissioners would have power, first, to determine the amount of capital necessary for the proper carrying on of each undertaking in their district; and, next, the rate of profit to be allowed. They could then prepare a Bill defining the rights, duties, and obligations of both manufacturer and consumer. He suggested that a fair capital would be £2 2s. per 1000 cubic feet of gas sent out, on which 8 per cent. profit could be allowed, with the right to form a reserve fund at 2 per cent. per annum until 10 per cent. of the authorized capital was reached. When the maximum dividend was earned, and the reserve fund filled up, the Commissioners could examine the accounts, and fix on a fair price at which gas could be sold. This should hold good for 25 years, subject to a sliding-scale arrangement, allowing the shareholders to participate in the advantage due to any reduction in price below the standard rate. In return for the obligations so undertaken, the company were to be protected from competition. The author of the paper had sent circulars to the managers of 78 gas undertakings in Massachusetts, with the view of asertaining their opinion as to the present Commission. Out of 38 replies, 32 were satisfied, three were not, two were indifferent, and one only partly satisfied. Four of the affirmatives suggested that the Commissioners should be appointed for four or six instead of three years; and that one of them should be a qualified gas engineer. If the Commission was so satisfactory in Massachusetts, why should not a similar one be equally so in Ohio? One noticeable feature was the rise in the value of gas stocks since its appointment. In conclusion, Mr. Butterworth said he thought it would be possible to form one for Ohio; and he enumerated the advantages thus obtainable, as the establishment of a reliable bureau for information relative to the gas industry, a fair board of arbitration for the settlement of disputes between gas companies and the public, protection from raiding companies and from petty or hostile legislation, a check on the idea of the municipal control of the companies, and the introduction of a uniform system of accounts.

Discussion having been invited, Mr. Wilkiemeyer agreed that the public needed educating about gas undertakings and their rights; and he pointed out that this could only be done when things were going quietly. It would be of no use to attempt it at a time of disturbance about quality or price. Mr. Barker (a member of the Massachusetts Gas Commission) addressed the meeting, on the invitation of the President. He said the subject was important to all concerned; and the consumers and the companies had many interests in common. Some doubt existed as to the possibility of avoiding abuse of the authority vested in a Gas Commission; but he pointed out that in a small one the power vested in each member was great, and the responsibility of each was so immediate as to render him very careful and considerate in all he did. For these reasons he thought a Commission was not likely to be either corrupt or rash in their decisions. In a body composed of (say) 24 members, the responsibility was not so immediate or so clear as in a board of three. He thought the paper clearly showed the benefits that had attended the appointment of the Massachusetts Gas Commission, and also those that would follow the appointment of a Commission in any other State. On behalf of the public it might be mentioned that the establishment of the Commission had led to a steady reduction in the price of gas. With regard to the form of the Gas Act, the legislation in Massachusetts had been a matter of growth. He did not say that it was yet quite perfect; and certain points in the suggestions advanced by General Hickenlooper were worth consideration. The English sliding-scale system was a desirable thing to adopt. In reply to an inquiry, he pointed out that the Act provided for an increase as well as a decrease in the price of gas; so that in the event of a large increase occurring in the price of coal or other expenditure, the companies could go before the Commission at any time and obtain permission to raise their charge. None of the companies objected to filling up the returns, or complained that they were injured by the state of their affairs being made known. At first there was opposition to the publishing of accounts, but it had ceased for some few years; and he imagined that it did not bring the disastrous results that were once apprehended. Mr. Cantine thought that a Commission which understood the subject, and were prepared to deal fairly with the companies in respect to increase as well as decrease in price, would be very much better than the city councilman with whom they at present had to deal; but if they were going to have a law in Ohio, he considered it would be better to leave out the inquisitorial feature of annual returns. Very few people cared to expose their business affairs; and he thought the public had no more right to know the inner workings of a gas company than those of a mill company or a grocery. Competition and attention to their own interests was sufficient inducement to keep the accounts straight; and therefore he failed to see the good of publishing them. Mr. Harbison said that in Connecticut they were nearly unanimous in the opinion that a Gas Commission was unnecessary for that State; and he failed to see how one would benefit his Company. He had always believed that his Directors were able to do as well, both for themselves and their customers, as any body of gentlemen who might not be so familiar with their peculiar conditions. If a board of directors needed a Commission to tell them when to reduce the price of gas or to extend their works, they had evidently mistaken their calling. He believed in an honest front and no secrets in the business; but at the same time, he did not agree with the unqualified publication of details. The President spoke strongly in favour of full and complete annual returns being made to the Commission. They could not, in many cases, form a fair opinion without them; and he did not think that the comparison between a gas company and a grocery held good in this case.

Mr. E. Printz, of Zanesville, followed with a paper on "The Alleged Popular Prejudice against Gas Companies and how best to Eradicate it." He said some of the causes that produced this prejudice were the personal unpopularity of one or more of the directors, or the high-handed or careless conduct, in attention to complaints, of the officials. Excessive profits, and the unwise plan of keeping everything connected with the gas-works as a mysterous secret, also had a bad effect. With regard to

the prejudice entertained against the meter, this could best be met by exhibiting one with a glass case at the office, or otherwise instructing the public as to its construction and working. Teach them to read the index, and to detect leaks by the test dial. An important matter was attention to the sale of gas, which should be pushed like that of any other commodity. Let the secretary look after all new buildings in the district, and see that the owner was canvassed to have the pipes laid on, and subsequently the occupier to take a supply. Then there should be careful attention to all complaints; and good burners should be supplied and fixed gratis. As people were apt to remember the heaviest monthly bills only, and to forget the light ones, it was a good plan to send out annually a statement showing the year's consumption, and the average monthly payment. They should advertise freely in local papers and otherwise, supply good gas at a fair price, be satisfied with moderate profits, and be courteous to the customers, and then there would not be much trouble.

After a short discussion, a paper on "The Desirability of a Uniform System of Gas Companies' Accounts," was read by Mr. A. L. Lathrop. The author of it advocated uniformity as necessary for comparative purposes; and he mentioned the form established by the Massachusetts Gas Commission, that used by English Gas Companies, and that devised by a Committee of the Western Gas Association, as in every way satisfactory. He suggested that the Secretary should communicate with the Companies in the State, and ascertain whether or not it would be practiable to adopt a uniform system. Having done this, they might arrange to exchange reports. The recommendations contained in the paper were strongly supported by Mr. Harbison and others; and, after some discussion, a Committee of three was appointed, to devise a suitable form of accounts—power being given to them to confer with the Committees of the Western and American Associations, with the view of adopting a general form suitable to all.

(To be continued.)

REGISTER OF PATENTS.

Gas-Heated Ovens.—Brophy, M. M., of High Holborn. No. 6661; April 30, 1890. [11d.]

This invention relates to gas-heated ovens for fixing colours in glass, for baking bread and the like, and for other purposes.

The heating or combustion chamber in which the gas is burnt has a floor, consisting of a metallic or other plate heated by the burning gas, and which imparts its heats by radiation to the materials to be heated, so that they are not injured by the fumes of the gas. At each side of the heating chamber, and opening into it, are arranged a pair or several pairs of regenerating chambers, each of which has a series of perforated plates of fire-clay or other refractory material or fire-bricks suitably spaced, and is connected to a chimney flue. At the point of junction of the flues is a valve of special construction, for allowing the products of combustion to pass alternately to the chimney flue. The gas and air for combustion in the heating chamber are admitted at the same time to the chambers alternately—that is to say, the gas is admitted to one chamber and the air to the other chamber of each pair; the admission being controlled by suitable valves.

In some cases there is a carriage or trolly upon which the material to be heated is adapted to be moved into position on to a frame beneath the floor of the combustion chamber; and means are provided for raising and lowering the frame towards and from the floor of the combustion chamber. These two latter movements can be effected automatically by suitable mechanism. In this construction of furnace, the gas and air are admitted to chambers on one side of the combustion chamber, and burned therein; the products of combustion passing through, and imparting their heat to, the other chambers on the other side of the combustion chamber. The roof of this chamber over the flame from each pair of regenerating chambers is formed of such a curve as to radiate, and thereby distribute, the heat equally on the floor of the chamber.

In some cases, when using several pairs of regenerating chambers, an arrangement may be made so that the admission of gas and air takes places in every alternate pair on one side of the combustion chamber, the other alternate pairs being heated by the products of combustion from the chamber. When this is so arranged, however, the flames issuing from each pair of regenerating chambers have to be isolated by division walls.

Incandescent Gas-Lights.—Lungren, C. M., of New York. No. 17,674; Nov. 4, 1890. [6d.]

This invention relates to an improved method of making filamentary bodies composed of the refractory earths or metallic oxides, to be used in incandescent gas lighting; and it consists in weaving or otherwise interlacing threads or wires of the metallic oxides or refractory earths into the form of an open mesh or network arranged in any shape adapted to the flame—such as a cone or tube.

As heretofore practised, says the patentee, the method has been to wind the threads comprising the structure upon a mandrel of the desired shape, and to press them together at the points of crossing. In making a cone, for instance, all the threads running lengthwise of the conical mandrel are wound; then the coil is wound over these; and when the two cross, they are pressed together. When the threads are fine, there is great danger in this method of construction of cutting them in two when the pressure is sufficient to make them adhere. A more important objection to this method of construction is, however, the rigidity of the resulting structure, which prevents the parts expanding and contracting freely under the changes of temperature to which the structure is afterwards subjected. To obviate these objections, the inventor proposes to weave or otherwise interlace the threads comprising the structure; and this leaves all the parts free to move with regard to each other, while at the same time they are held in place, and the form of the structure as a whole is preserved.

Gas Compressing Pumps for Refrigerating Apparatus.—Mayer, C. G., of New York. No. 85; Jan. 2, 1891. [8d.]

One of the objects of this invention is to facilitate the starting of the gas pumps or compressors of refrigerating appliances, as this operation has hitherto been attended with several serious drawbacks. Heretofore in starting the pump, the high pressure or compressed ammonia gas which exists above the discharge valves of the pump, creates a pressure of from 150 to 200 lbs. per square inch on the valves, requiring an accumulation of power or momentum to overcome. The starting against this pressure has been hitherto accomplished under difficulties, and has generally needed manual assistance in passing dead-centres until a headway has been gained. To dispense with this difficulty, means are provided for shutting off the high-pressure gas temporarily above the discharge valves of the pump, and opening a pipe or pipes connecting the low-pressure directly to the high-pressure side of the pump; so that it may be started with the high pressure shut off, but only until a certain momentum is obtained.

Gas-Stoves.—Haddan, H. J.; communicated from E. Grube, of Hamburg. No. 720; Jan. 14, 1891. [6d.]

This invention in gas cooking-stoves relates to the construction of the grid or grating on which the cooking vessels are placed and to gas feed for supplying the burner.

The grating for the support of the cooking utensils is constructed in a manner somewhat similar to a venetian shutter; so that the intervals between the grate-bars may be set for a certain maximum width of opening, or closed completely, or set at any desired width less than the maximum. By this means the influence upon the cooking appliances of the heating flames which burn underneath the grating may be easily regulated; or upon the complete closure of the shutter-like grating, the direct touch of the flame upon the cooking-utensils is prevented. The grating then acts as a complete solid surface, which is heated, and will diffuse or distribute the heat.

The gas feed of the burner is as follows: The burner supply-pipe is placed loosely into the stove-frame, and so that it will be located for a considerable length directly above or in the flames from the burner. At the same time the end of the supply-pipe is bent to project within a hood or air inlet into the burner, in order to produce a Bunsen burner. The gas is thus heated in the supply-pipe during the working of the stove, and expanding, it gives greater effect in use.

Measuring and Mixing Air and Gas in Definite Uniform Proportions, and Delivering the Same Under Definite Uniform Pressure.—Thompson, W. P.; communicated from J. Tayler, of New York. No. 2427; Feb. 10, 1891. [8d.]

This invention relates to means for delivering air and other gases from a source of supply to places where it is to be used—as, for instance, in gasholders, air and gas pumps, gas mixers, carburetters, &c.; and the object is to provide means more particularly for mixing air and illuminating hydrocarbon gas in definite uniform proportions to form a fuel gas, and for delivering the fuel gas at a predetermined uniform pressure for consumption as needed.

The apparatus employed for the purpose comprises a closed liquid receptacle having separate induction ports and an eduction port, isolated induction chambers and an eduction chamber. The mixing chamber communicates with the eduction chamber. Separate drums are mounted to revolve on horizontal axes in the liquid receptacle, to or slightly above which axes the drums are to be immersed. Each drum is formed with a plurality of longitudinal spiral compartments, each of which has end ports to communicate respectively with the induction and eduction chambers—approximately 180° apart, so that always one at least of the end ports of each spiral compartment will be sealed by the liquid. There is also provided, of course, means for revolving the two drums at predetermined relative speeds.

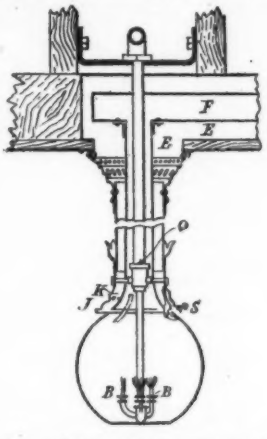
Gas-Engine.—Coffey, B. H., of Philadelphia, U.S.A. No. 3350; Feb. 24, 1891. [11d.]

This invention relates to the details of construction for a gas-engine—more especially the combination of the connecting-rod, the crank on the main shaft, a guiding pivot shaft, having gear-wheels attached to it, racks engaging gear-wheels, and mechanism for rotating the shaft and its gears (so as to change its position on the racks), a governor connected with and controlling the movement of the mechanism, and a slotted link pivoted to the connecting rod and crank at fixed points and to the shaft itself by means of its slot. The effect of this combination upon the motion of the piston is to cause the piston to make two strokes for each revolution of the shaft, and an explosion occurs for each revolution.

Ventilating Gas-Lamps.—Bray, G., of Leeds. No. 3040; Feb. 19, 1891. [6d.]

This lamp consists of an inner and outer vertical shaft (with an open annular space between the two), terminating at the burner end in conical form, having an open annular space between. The outer casting at the ceiling end terminates in a cone connected to a flue or conduit E. The inner shaft terminates in a conduit F within the first-named. So long as these flues are horizontal, they are continued separate; but on reaching a vertical shaft to the open air, the double flue is passed into a single vertical shaft terminating at the top of the building. The gas is conveyed down the centre shaft by means of a pipe carried down to a point below the apex of the two bottom cones J and K, and to which is secured a four-way piece to support the whole structure of the lamp and ventilator—hitherto carried by attachments to the ceiling. To the bottom of the four-way piece is screwed a vertical pipe and body with arms carrying the burners B; and beneath the two cones J and K is a globe attached to the inside of the outer cone. On placing the top rim of the globe on to two fixed lugs, and passing the hinged lug by means of the hand-screw S into the same position as the fixed one, the globe is held securely in its proper position. Within

the inner vertical shaft about the apex of the cone K is a check or baffler Q, consisting of a disc made in two pieces, and carried on the top of the four-way piece. This disc partially fills the area of the inner shaft, leaving an annular space for the passage of the products of combustion. The area of this inner shaft is varied in relation to the length of its vertical shaft, and the size of the burners—that is: if 10 cubic feet of gas are burned per hour, the area of the inner shaft must be larger than in the case of a consumption of 15 cubic feet per hour.



As to the globe, the patentee proposes to use the ordinary globe with apertures top and bottom of about the same area; but in order to insure the passing away of the products of combustion and the heated gases from the globe up either the inner or outer shaft, the outer circumference of the upper aperture of the globe is placed within the outer diameter of the outer cone, with an air space between the top of the globe and the bottom of the cone, through which air passes over the top part of the globe into the annular space at the bottom of the cone. By this arrangement, the further advantage follows of keeping the top edge of the globe cool; and thus reducing the liability of the globe to breakage.

APPLICATIONS FOR LETTERS PATENT.

7213.—Williams, H., "Improvements in gas motor and similar engines." April 27.

7252.—Howell, H., "A new or improved apparatus for automatically lighting and extinguishing gas-burners." April 27.

7269.—Ephraim, A., "An improved spreading disc for petroleum and gas burners." April 27.

7284.—Cruikshank, G. M., "Improvements in gas-burners." A communication from J. Bergeon. April 28.

7313.—Pinkney, C. W., "Improvements in engines worked by the explosion of gas." April 28.

7379.—Cowan, W., "Improvements in prepayment gas-meters." April 29.

7422.—Simmons, A. B., "A combination tap socket and pipe connection or sleeve for pipe to enable water or gas to be drawn from any desired part of a pipe without the usual joint; applicable also for closing the open parts of burst pipes." April 29.

7521.—Preston, J. B., and Nelson, L. H., "A motor operated by compressed air or gas without exhaust." April 30.

7546.—Simmance, J. F., and Mathias, H. D., "Facilitating the use of gas in connection with existing hot-water systems." May 1.

7558.—Loewenthal, L., "Improved manufacture or production of gas, and means or apparatus for the storeage and application thereof." May 1.

7583.—Bouran J. D., "Improvements in coal-gas retorts." May 1.

Messrs. T. Fletcher and Co. have lately been holding exhibitions of their gas-ranges and other appliances at Rochester, Maidenhead, West Ham, Plymouth, Lea Bridge, Ramsgate, &c. The various lectures on cookery delivered on these occasions were largely attended, and evidently much appreciated. The firm are now exhibiting at Bristol, Leytonstone, Tottenham, Sutton, and Acton, under the auspices of the respective Gas Companies, in addition to which they are showing their appliances at the four weekly exhibitions held by The Gaslight and Coke Company and the South Metropolitan Gas Company.

A Novel Feature at a Gas Cookery Lecture.—The Gaslight and Coke Company have lately been holding successful gas-cooking demonstrations at the Agricultural Hall, Battersea, and Harlesden; the lecturesses being Miss Edden, Miss Cameron, and Mrs. Wilkinson. At the Prince's Saloon, in the Agricultural Hall, a novel feature was made of a "Bachelor's Breakfast." A little dramatic element was imported into the affair by Mr. Stubington and his assistant—both inspectors of the Company—taking part in the sketch. The "bachelor" came on in shirt-sleeves, with his collar and necktie in his hand, and told the servant (Miss Edden) that they had only just risen, and they had to catch a train in 20 minutes. Calling out to the lodger to "come down at once," and adding that "there would be no time for breakfast," they both went and finished their toilet. Miss Edden meanwhile lit the gas-stoves; put on the kettle, fried some ham and eggs, made some toast, cooked a steak, prepared tea and cocoa for two, and in 12 minutes all the "lodgers" sat down to a good hearty meal, amidst the applause of the audience. The incident was intended to diversify the monotony of the ordinary cooking lectures; and it proved very successful indeed. Among the exhibitors of stoves and heating appliances were Messrs. Fletcher, Main, Wright, Parkinson, Davis, and Sugg. Asbestos fires were shown by Messrs. Pardoe and Son.; regulators by Messrs. Slatter and Watkins; and baths, &c., by Messrs. Ewart and Son.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following progress was made with Bills last week:—

Bills read the first time: Barmouth Local Board Bill; Falmouth Water Bill; Gas and Water Orders Confirmation Bill, to confirm certain Provisional Orders relating to Southborough Gas, Cirencester Water, Matlock Water, and Seaton and Beer Water; Leighton Buzzard Gas Bill; Penmaenmawr Local Board Bill.

Bill read a second time and committed: Garw and Ogmore Gas Bill.

Bill reported: Sunderland and South Shields Water Bill.

Bills read the third time and passed: Alloa Water Bill; Kettering Gas Bill; Northallerton Water Bill.

HOUSE OF COMMONS.

Thursday, May 7.

GAS COMBUSTION PRODUCTS AND THE ROOF OF WESTMINSTER HALL.

Mr. Story-Maskelyne asked the First Commissioner of Works whether, considering the deleterious effect of the acid products of the combustion of gas on the ancient wooden roof of Westminster Hall, he would consider the advisability of substituting the electric light for the gas-lights at present employed.

Mr. Plunket: I have carefully inquired into this matter, and I find that at one spot the hammer beams in the roof of Westminster Hall have been blackened, though not charred, by gas-lamps, which are placed some 15 or 20 feet below them. But there is no ground for believing that any permanent injury has been done to these beams; and no other part of the roof has been at all affected. We are replacing, as rapidly as we can, gas by electric lighting throughout the Palace generally; and I hope we shall soon reach the lamps referred to in the question.

THE POLLUTION OF THE THAMES AT STAINES.

Mr. Atherley-Jones asked the President of the Local Government Board if his attention had been drawn to the fact that the sewage matter from the cesspools in the Staines district flows in large quantities into the Thames above the intakes of the London Water Companies, and that for some years past typhoid and other zymotic diseases have been endemic in that district. He further inquired whether or not the Local Government Board intended to take any steps to remedy this state of things.

Mr. Ritchie: As regards the Staines Urban Sanitary District, the arrangements with respect to the disposal of sewage are very unsatisfactory; and I have no reason to doubt that some of the sewage from this district finds its way unpurified into the Thames above the intake of the Water Companies. This matter has been the subject of repeated communications to the Local Board; but hitherto they appear to have failed to realize their responsibility in the matter. With regard to the Staines Rural Sanitary District, the condition of things is described in a report by one of the Local Government Board Inspectors, which was issued last month, and which the Board have brought specially under the attention of the Local Authority and the County Council for Middlesex. In this report, the Inspector states that in no one of the past seven years for which he has records has the district been free from typhoid fever; and that this disease has been very high in rank among the zymotic causes of death. The Thames Conservancy Board instituted proceedings against the Staines Local Board by indictment; but they failed, the Court holding that the Local Board had not caused or suffered the sewage to flow into the river, as it passed by drains which had been provided by the owners and occupiers of houses, and not by the Local Board. The Conservators have served notice on more than a hundred individuals to discontinue this discharge of sewage. The statute allows twelve months for compliance with the requirements of the notice. This time is now expiring; and the Board are told by the Conservators that it is intended to proceed against some of these persons by way of test cases. I was informed on the 28th of last month that, should nothing satisfactory result from the recent election of members of the Local Board, the test cases will be proceeded with. The Local Government Board are empowered, under section 299 of the Public Health Act, on formal complaint being made by any persons that a sanitary authority have made default in not providing sufficient sewers for their districts, to direct a local inquiry; and if, after inquiry, they are satisfied of the default, to issue an order requiring the authority to discharge their duty in the matter. If the Board receive such a complaint from persons resident in the district, I will see that prompt action is taken.

The following progress was made with Bills last week:

Bills read the first time: Alloa Water Bill; Electric Lighting Provisional Orders Bills (Nos. 5 to 11), to confirm Provisional Orders made by the Board of Trade in reference to Birmingham, Bromley (Kent), Camberwell, Cardiff, City of London, Clerkenwell, Edinburgh, Exeter, Hertford, Ipswich, Islington, Killarney, Kingston-on-Thames, Liverpool, Newport, Paisley, Poole, Preston, Scarborough, Southwark, St. Luke's (Chelsea), St. Luke's (Middlesex), Torquay, Toxteth Park, Tunbridge Wells, Wandsworth District, Westminster, Weybridge, Whitby, Whitehaven, Withington, and Woolwich; Local Government Provisional Orders (Gas) Bill, to confirm Provisional Orders relating to Richmond (Yorks) and Selby.

Bill read a second time and committed: Dundee Water Bill.

Bills read the third time and passed: Barmouth Local Board Bill; Falmouth Water Bill; Mountain Ash Local Board Bill; Penmaenmawr Local Board Bill.

THE METROPOLITAN WATER SUPPLY INQUIRY.

Second Day—Thursday, April 30.

(*Before Sir* MATTHEW WHITE RIDLEY, *Chairman; Mr.* T. H. BOLTON, *Sir* ALGERNON BORTHWICK, *Mr.* BRISTOWE, *Mr.* H. W. LAWSON, *Mr.* J. W. LOWTHER, *Mr.* MURDOCH, *and Mr.* ROWNTREE.)

METROPOLIS WATER SUPPLY BILL.

To-day the Committee proceeded with the consideration of the above-named Bill, promoted by the London Vestries and District Boards, the object of which is "to place the water supply of the Metropolis and the adjoining districts under the control of a public authority, and to make further provisions for such supply," and, in order to effect this object, to acquire the existing water undertakings through the medium of a WaterTrust. There were a large number of opponents.

Mr. RICKARDS, in opening the case for the promoters, commenced by remarking that the Committee had already given their decision on the principle of entrusting the water supply to some central authority; and he then proceeded to point out that the Bill proposed to establish a Board of Arbitration to settle the terms upon which the water undertakings should be acquired. As an alternative to the creation of a Water Trust, the Bill gave the London County Council the option, by resolution passed within a certain period, of becoming themselves the Water Authority; while among the minor objects sought to be effected were the equalization of the water-rates throughout the whole of the Metropolitan area, and the re-arrangement of the supply so as to ensure a more adequate pressure of water for the extinction of fires, by conveying it through the existing mains from high-service reservoirs. Having traced the history of the inquiries into the subject from 1821 down to the Duke of Richmond's Commission in 1869 and Sir William Harcourt's Committee in 1880, the learned Counsel said the present Bill originated with the Vestry of St. James's, Westminster, in consequence of the strong feeling that the water question should be finally dealt with by Parliament, and that London should be put upon the same footing as a very large number of other municipal and local authorities. The ideas embodied in the Bill were approved of at a meeting of delegates from 32 Metropolitan Vestries and District Boards. The Government were then approached on the matter; but they intimated that it would not be practical for them to take up the subject themselves this year. The conference of Vestries and District Boards then passed a resolution to the effect that, as the London County Council had no power to introduce a Bill into Parliament for the purchase of the Water Companies' undertakings, the other local authorities should, following the precedent successfully set in the case of the gas legislation for the Metropolis, unite in giving notice of, and preparing a Bill for the purchase, and for power to set up a competing supply. The latter idea, however, had since been abandoned as impracticable. As far as possible, the districts would be left as at present; but the proposed Water Trust would take over all the powers and obligations of the existing Companies. They hoped, however, to improve the supply, to equalize the rates charged, to give a better service for the extinction of fires, and to supply water more economically. The districts which form the watershed of the Thames and the Lea, from which the present supply of water to the Metropolis is taken, would be left precisely as they were now, and would be neither better or worse off than at present. The Vestries considered that the existing supply from the Thames, the Lea, and the chalk wells of Kent, when supplemented by water from the lower strata—the chalk strata of Hertfordshire and Surrey—would furnish sufficient water of good quality for at any rate some years to come. He maintained that the Bill was an honest and thorough attempt to deal with the whole question on lines upon which it had already been dealt with by other communities. There was this important provision in the Bill, which he regarded as a necessary one—viz., that the newly-constituted authority should have a monopoly of the supply; and it was from this point of view that they thought it was incumbent upon them to acquire the undertakings of the existing Water Companies. This had been done, he believed, in all cases in which Parliament had entrusted the supply to local authorities. He had a list of 72 authorities who supplied water in their districts since 1866, by having first of all purchased the existing undertakings, though these were several—notably Manchester in 1847, and Glasgow in 1855—who had carried out this operation earlier; and he thought that, in the vast majority of cases, the terms upon which these undertakings had been acquired were settled by arbitration. In framing the Bill, the promoters had endeavoured to deal fairly with the Water Companies—to give them a fair and an equitable sum for the purchase of their undertakings—and not to burden the ratepayers with too large a debt. They had also endeavoured to show a due, but not an undue, regard to the interests of persons who had securities upon these undertakings; and they proposed to leave the debenture-holders and mortgagees in the same position, with regard to the undertaking of the Water Trust, as they were in at present. They had also considered the question of the possible supersession of the officers of the different Companies, and what superannuation allowances or compensation they would be entitled to. In fact, they had disturbed as little as possible the relations between the consumers and suppliers of water—those who had a vested interest in the undertakings. At the same time, he thought it right to point out that the Bill obviously meant the extinction of the rights of the existing Companies. They had no monopoly of supply, for although they had been "districted" in the same way as the Gas and Electric Light Companies, it was quite competent to any body or any company to apply to Parliament for power to set up a competing water supply within any of the districts. In endeavouring to deal with the Companies on an equitable basis, the promoters did not wish to give them more than they thought represented the capital sum of what they could earn in future, looking forward to the capital expenditure they might have eventually to incur by going to fresh sources of supply and for other purposes. The direction to the Arbitrators in the Bill as originally drawn, to "have regard to the value of such undertakings," was meant to imply something beyond merely considering the present market quoted value of the stock of the Companies; but these words had since been supplemented in a way that would make the point clear. Although the question was a difficult one, and involved large compensation, it really was a question which differed in degree rather than in kind from that which had been successfully grappled by the Corporations of Manchester, Birmingham, Glasgow, and many other places. The learned Counsel proceeded to refer to, and compare the principles of compensation laid down in Lord Cross's Bill of 1880 with the present Bill, and said that the fact that the former measure was rejected would be present to the minds of the Arbitrators in fixing the value of the undertakings. Seeing that there might have to be ten inquiries if the Bill were passed, it was not advisable that in each case there should be fresh Arbitrators to deal over and over again with the same issues. Therefore the Bill proposed the constitution of a Board of Arbitration; and when once principles had been laid down in the course of the first arbitration, no doubt these would, to a certain extent, be accepted by the parties to the others. Dealing with the question of the possibility of an independent or competing supply, he said, in the first place, it was quite undecided when they should take it, for it was entirely unknown and unascertained what source would be best. They might supplement—and they contemplated that the Water Trust would do so—the existing sources from the districts of the Rickmansworth and Leatherhead Companies; and it might be that as they acquired additional sources of supply, such as were afforded by those districts, they would eventually supersede the necessity of taking the quantity of water they now drew from the Thames. Or it might very well be that the Thames water would be taken in smaller quantities for sanitary purposes, and the potable water be drawn from the chalk districts; but this they considered was rather a matter for the future. The question now was that the existing sources, supplemented from Leatherhead and Rickmansworth, were quite sufficient for the present purposes of the Metropolis. After referring to the conclusions of the Duke of Richmond's Commission as to the then probable future demand, which they thought might be met with only moderate additions to their then engineering means, he pointed out that the population of the Metropolis had increased since 1869 at a greater ratio than the Commission anticipated, and certain things had taken place which had rendered the water in the Thames not quite as good for some purposes as it was, although the system of filtration, as shown by the report of the Official Water Examiner, was in a satisfactory condition, except in times of drought, when the water in the Thames was very low. Therefore they thought that there should be some supplementary supply, though the necessity for an independent supply was not proved. The question of additional means being adopted for possibly intercepting the water before it reached the Thames for better storeage where necessary, was also one which could be dealt with, and would still leave the present sources of supply, supplemented as he had said, sufficient both in quantity and quality. In regard to the question of an independent supply, he doubted whether it would be physically possible, or in any way advisable, to lay down mains throughout thousands of streets, intercepting the traffic for a number of years; and he also doubted whether, in some cases, there could be found room for fresh mains.

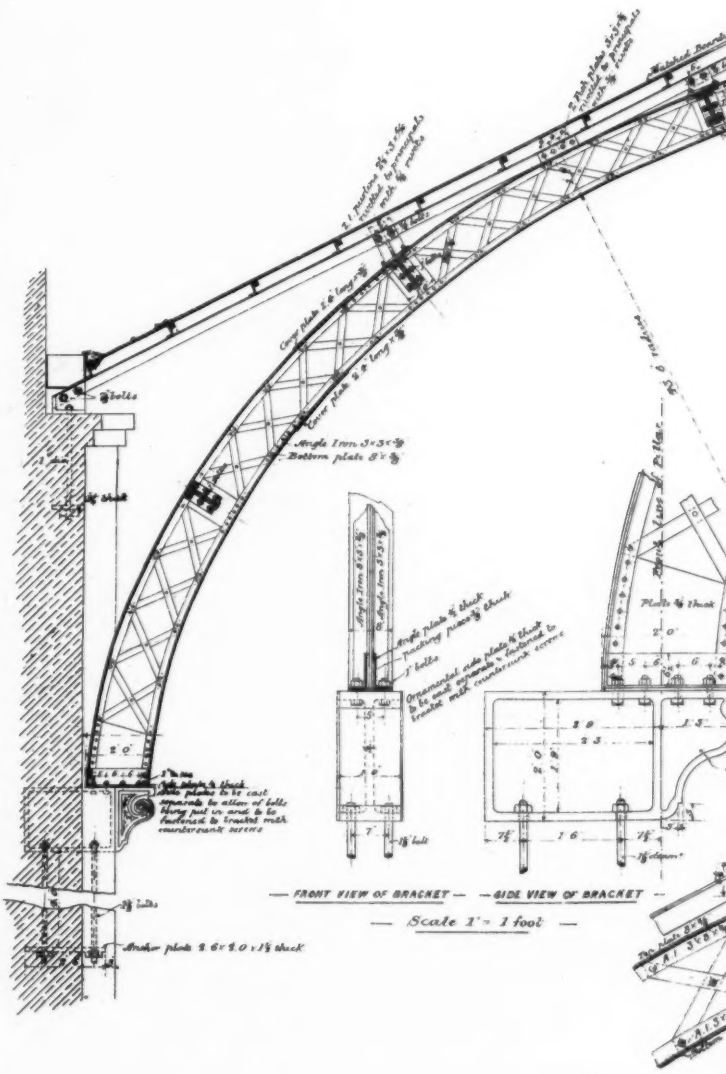
The CHAIRMAN remarked that the Committee did not want any statement to that effect, as the difficulties of an independent supply were too obvious.

Mr. RICKARDS said then the question remained as to the economy that would be effected in the distribution of water by one central authority as against a great number of independent Companies at the present time. On this question some very valuable evidence was given by the late Sir Francis Bolton, the then Official Water Examiner, on Lord Cross's Bill.

The CHAIRMAN said Mr. Rickards need not go into that matter. The Committee took that as granted; it was one of the objects of placing the supply in the hands of a central authority.

Mr. RICKARDS said that, of course, by this means they had greater economy in distribution, as in high-lying districts they could avail themselves, of high reservoirs, make junctions between the mains, and use the water of one Company for the supply of another district. As one instance of this he mentioned that at Putney Heath there are some high-service reservoirs, and in their immediate vicinity there were a number of houses, on the same level as the reservoirs, supplied by the Southwark and Vauxhall Water Company. Obviously, the expense of carrying the water through miles of mains was very great, and could be saved by concentrating the undertakings of the different Companies under one authority. In opening the case for the London Water Commission Bill, Mr. Littler had described it as a "leap in the dark;" but the proposals of the present Bill were not so in any sense, because they were not buying undertakings that were not supplying water at the present time. They were buying works and plant, some parts of which were useless, and for which they ought not to pay much; but they were supplying water to an enormous population, and when acquired under this Bill it was considered they would supply water to the same population under more favourable circumstances. The provision for the assessments of compensation by the Board of Arbitration as it now stood read as follows: "In estimating the amount of compensation payable in respect of the undertaking of any Company, the Board of Arbitration shall have regard to the value of such undertaking prior to the introduction into Parliament of the Bill for this Act." A certain interval—and in some cases probably a long one—would elapse before the Board would sit in order to assess the compensation payable to the Companies; but, in the meanwhile, the Companies might put their houses in order at a greater expense than they otherwise would do, in order to get an increased value for their undertakings. They might issue fresh capital, construct new works, and then claim compensation for those works which might be useless to the Water Trust when it came into office. This was the reason for introducing those words into the Bill. It might also be that, when it was seen that the Water Trust were to acquire the undertakings, and a larger and more extended security would be given to the shareholders than at present existed, the stocks of the Companies would become inflated, and the Arbitrators would be asked to have regard to the condition of the stocks then rather than to their normal state. He therefore proposed to add the following words: "And the adequacy, both as regards the quantity and the quality of the water derived therefrom, or the sources of supply from which such Company takes its water, in view of the present requirements of the district supplied by such

BUENOS AYRES CO-OPERA


Bolts
Angle 3 rom 3½×3½×⅜
Bottom plate 8½×⅜
Cover plate 2'-8" long×⅜
Cover plate 2'-8" long×⅜
Angle 3 rom 3½×3½×⅜
Bottom plate 8½×⅜
Angle plate ⅜ thick
Tightening piece ⅜ thick
7/8" bolts
Ornamental side plates ⅜ thick to be cast separate & fastened to bracket with countersunk screws
Anchor plate 2'-6"×2'-0"×1⅛ thick
— FRONT VIEW OF BRACKET —
— SIDE VIEW OF BRACKET —
— Scale 1"= 1 foot —

KING BELL & RAILTON, PHOTO LITHOS, 13, COUGH SQUARE, & 4, BOLT COURT, LONDON, E.C.

OPERATIVE GAS WORKS

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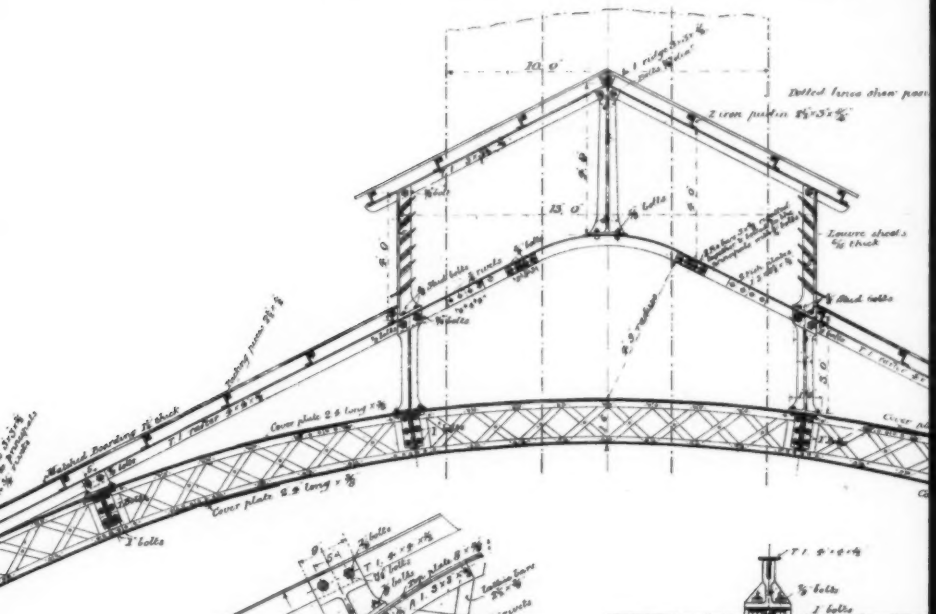
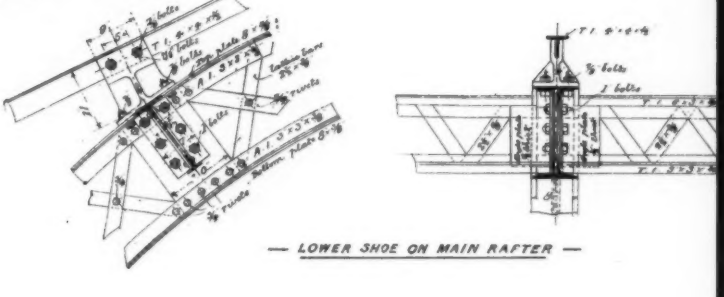
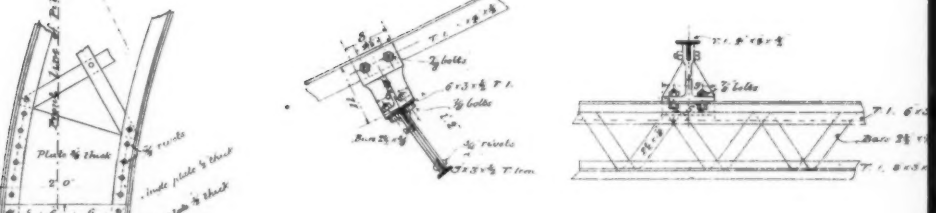
— Scale in Feet —

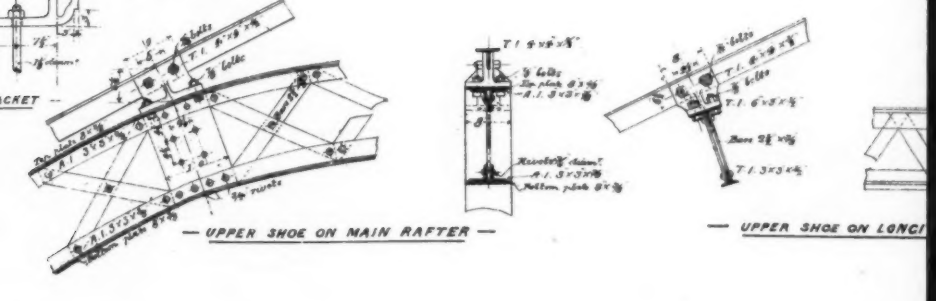




— LOWER SHOE ON MAIN RAFTER —



— LOWER SHOE ON LONGITUDINAL GIRDER —



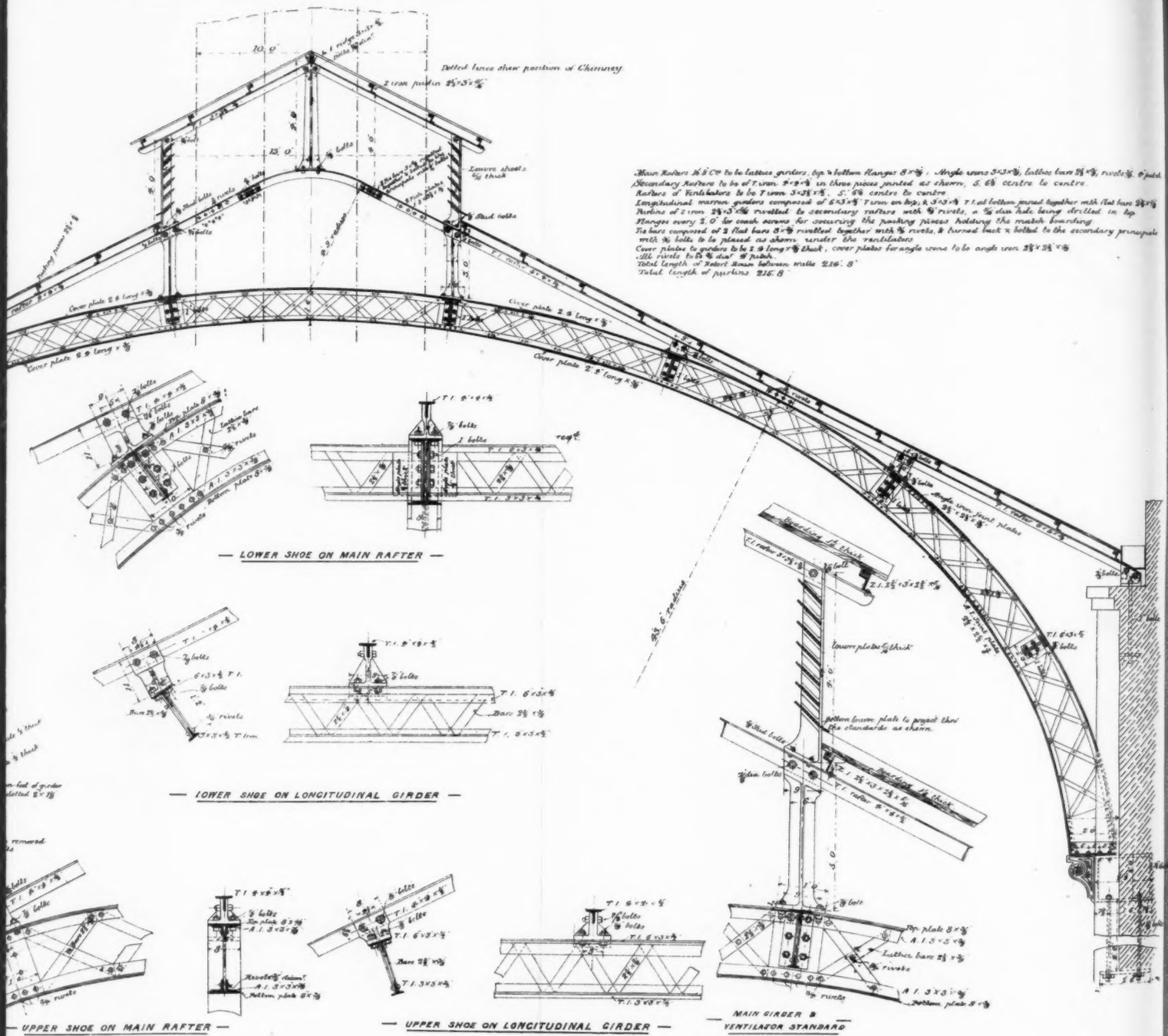
— UPPER SHOE ON MAIN RAFTER —

— UPPER SHOE ON LONGI

IVE GAS WORKS

RETORT HOUSE ROOF

— Scale in Feet —


Main Rafters 16'6" C^rs to be lattice girders, top & bottom Flanges 6"×⅜" ; Angle irons 3"×3"×⅜", lattice bars 2½"×⅜", rivets ⅝" pitch.
Secondary Rafters to be of T iron 9"×9"×⅝" in three pieces jointed as shewn, 5'.6" centre to centre.
Rafters of Ventilators to be T iron 3"×3½"×⅝", 5'.6" centre to centre.
Longitudinal warren girders composed of 6"×3"×⅝" T iron on top, & 3"×3"×⅝" T I. at bottom joined together with flat bars 2½"×⅝"
Purlins of Z iron 2½"×3"×⅝" rivetted to secondary rafters with ⅝" rivets, a ⅝" dia. hole being drilled in top flange every 2'.0" for each screw for securing the packing pieces holding the match boarding
Tie bars composed of 2 flat bars 3"×⅝" rivetted together with ⅝" rivets, & turned back & bolted to the secondary principle with ⅝" bolts to be placed as shewn under the ventilators
Cover plates to girders to be 2'.9" long × ⅝" thick, cover plates for angle irons to be angle iron 2½"×2½"×⅜
All rivets to be ⅝" dia^r @ pitch.
Total length of Retort House between walls 216'.8"
Total length of purlins 216'.8"
10'.0"
15'.0"
Dotted lines shew position of Chimney
Z iron purlin 2½"×3"×⅜"
Louvre sheets ⅛" thick
Cover plate 2'.9" long × ⅝"
Cover plate 2'.5" long × ⅝"
Cover plate 2'.9" long × ⅝"
Boarding ⅝" thick
Louvre plates ⅛" thick
bottom louvre plate to project thro' the standards as shewn.
Top plate 8"×⅜"
A.I. 3"×3"×⅝"
Lattice bars 2½"×⅜"
Bottom plate 8"×⅜"

— LOWER SHOE ON MAIN RAFTER —

— LOWER SHOE ON LONGITUDINAL GIRDER —

— UPPER SHOE ON MAIN RAFTER —

— UPPER SHOE ON LONGITUDINAL GIRDER —

— MAIN GIRDER & VENTILATOR STANDARD —

G. E. STEVENSON, Engineer.

Company and the efficiency of the works of such Company." If there were any additional words which could be suggested by his learned friends to be inserted in that clause, the promoters of the Bill would give the greatest possible consideration to them, for they wished to keep nothing back, and were willing, of course, to accept the verdict of the Committee, whatever it might be, either on the general principles of the Bill or upon its particular provisions. Further referring to the proposal to take water from the Rickmansworth and Leatherhead districts, the learned Counsel said the promoters did not believe that they would deprive the inhabitants of those districts of any water that they at present had, for this reason: They had only sunk wells to a certain depth, and this was sufficient for the supply of their districts. The promoters proposed to sink wells to a greater depth, and take water which they hoped to show was at the present time running to waste, or at any rate a large quantity of it. They would be under precisely the same obligations to the consumers in those districts, except that they hoped to supply them on more economical terms, and in some ways perhaps even more efficiently, than the present Companies, although he might say at once that they were not there to find fault with the manner in which either the Metropolitan Companies or the Leatherhead and Rickmansworth Companies treated their customers. Passing on to the financial aspect of the question, he said he felt some diffidence in dealing with it, as he was not a financier; but the way in which they proposed paying for the water undertakings was by the issue and creation of consolidated water stock. In the case of the ordinary shareholders of the Companies, they proposed that there should, if they so thought fit, be allotted an amount of the new consolidated water stock equivalent in value to the amount of the shares they now held in the Companies, but with this very important proviso—that, supposing a Company claimed that the value of its undertaking was a million and a half, and the Board of Arbitration decided that its value was only one million, the different classes of shareholders in the Company would be allotted by the Board collectively, as a class, the proportionate amount of compensation to which they were entitled having regard to the extent of their holdings in the Company. If the market value of their stock was greater than the amount of compensation awarded by the Arbitrators, they would receive proportionately so much less in consolidated stock; or, if they preferred it, they would have the option of taking the sum in cash. The promoters considered that they would afford them a better, a more permanent, and a more desirable security than they now possessed; but if the shareholders were not of this opinion, and chose to have cash, in lieu of their present holdings, the stock would be thrown upon the market. They contemplated that the amount of cash payment that would have to be made in respect of each undertaking would not be very large; as they anticipated that the majority of the shareholders would take the stock of the Water Trust instead of that of the Companies. With regard to the security on which it was proposed to charge the interest on the stock issued, and the expenses generally of the Trust, they proposed first of all to give the security of the undertaking in proportion to the value of their holdings; secondly, the security of the water revenues, and, as a last resort, they purposed giving the security of the local rates in the Metropolitan area. He was quite aware that the last proposition might be considered unnecessary; and it was one which they certainly hoped would never have to be resorted to. Still, it was an additional security to the shareholders. The principle was not a new one, as it prevailed with regard to the Education Acts, and with regard to the expenses of the Metropolitan Asylums Board under the Metropolitan Poor Law Act of 1867.

The CHAIRMAN said it was not necessary to go into detail upon the point at present, in order to make the matter intelligible.

Mr. RICKARDS then passed on to the constitution of the Trust. The proposal of the Bill was, he said, to constitute a Water Trust which should represent, not what the London Water Commission proposed to do—viz., the watershed areas—but the water consumers themselves. In framing this portion of the Bill, they had in view the provisions of the Local Government Act of 1888 as applied to the Metropolis; and the electors for the Trust would be the county electors as under the Local Government Act of 1888. The provisions of this Act with regard to the number of the County Council and the way in which the members of the London County Council were elected, had been followed in many ways, though with some distinctions, in forming the Trust. As he had said, the constituents were to be the county electors. Each parliamentary borough in the Metropolis, or each division of a borough, where it was divided, elected two members to the County Council; but this had been varied in the case of the Trust. They considered that if they had the same number of members on the Trust as there were on the Council, it would be unworkable as a business body for dealing with the one subject of water; and therefore they proposed that each group of two parliamentary boroughs or divisions within the Metropolitan water area should return one member to serve on the Trust. This would give a body of 39 members, which he did not think would be considered too unwieldy.

Mr. LAWSON called attention to the schedule of the Bill, which showed that there were three divisions for Surrey set down there; and he asked if they returned one or one and a half members.

Mr. RICKARDS said he presumed they would return one and a half—that was to say, one division of Surrey would be joined to an adjacent division of Middlesex, or the next county. The Executive Committee of the Vestries carefully considered the question of whether the Trust should be an elective or a nominative one; and the opinion was greatly in favour of direct representation. But it was not one of the vital principles of the Bill that there should be direct representation; and it would be quite competent for the Committee to insert a provision, or put upon the promoters the insertion of a provision, that the Trust should be nominative and not elective—leaving the nominations to the local authorities or the County Councils. They considered that they had minimized the evils of a fresh election by providing that the electors to the Trust should be the county electors; that the same basis as in the Local Government Act of 1888 should be taken for the formation of the electoral areas—viz., existing parliamentary divisions; and that the elections should occur at the same time and place, and be subject to the same conditions as the County Council elections. It was not a vital principle of the Bill; but the promoters had carefully considered the question, and provided for the constitution of a Trust which should directly represent the water consumers in the persons of the county electors. The learned Counsel then proceeded to refer to the clauses of the Bill in detail—pointing out that the Trust was to have a period of two years in which to give notice to the Water Companies of their intention to purchase their undertakings; and inasmuch as the Trust might not be an "expert" body in water matters, power was given to them, if they thought fit, to avail themselves of the services of persons "chosen by them from the Chairmen, Directors, or principal officers of the Companies," who were to be called "consultative members," who would attend and take part in the meetings of the Trust and of the Committees, but without voting power. The number of consultative members was fixed at three; the period for which they might be appointed was three years; and provision was made for their remuneration. He then went on to refer to the various petitions against the Bill; and concluded by stating that the evidence he proposed to call consisted of that of Mr. Wilkins, the Honorary Secretary of the Executive Committee of the Vestries and District Boards, and certain representatives of other Vestries. An engineer would also be called, who would be corroborated by another engineer, on the question of the advisability of acquiring the undertakings of the Rickmansworth and Leatherhead Companies, and who would speak as to the large supply of potable water which the Trust might be expected to derive from the districts of those Companies. Then they would have witnesses who would explain the financial details of the Bill.

The CHAIRMAN said the Committee would probably not want much evidence from the Vestries after that of their authorized representative.

Mr. RICKARDS said he did not propose to repeat evidence over and over again; but he should hardly like it to be thought that a Bill of such magnitude and importance as the one before them was supported only by the evidence of one gentleman who took a great personal interest in the matter.

The CHAIRMAN said Mr. Wilkins represented the views of the Vestries; and if his statement was not challenged, he did not see the usefulness of calling a multiplicity of witnesses to say that they agreed with what he had said.

Mr. RICKARDS agreed, and hoped the Committee would not hesitate to stop the calling of evidence if they thought it necessary to do so.

The CHAIRMAN said they would endeavour to keep it as short as they could. The Bill divided itself into different branches.

Mr. RICKARDS said no doubt it did. He had indicated the main branches of it—the local support of the Bill, and the reasons for it; and the engineering and financial parts of the measure.

Third Day—Tuesday, May 5.

On the re-assembling of the Committee to-day, Mr. Rickards handed in maps showing the electoral areas from which the members of the proposed Water Trust are to be elected, and explained them to the Committee.

Mr. *H. Wilkins*, Vestry Clerk of St. James's, Westminster, was then called and examined by Mr. RICKARDS. He said that, as Honorary Secretary of the Executive Committee of the Vestries and District Boards who were promoting the Bill, he had very carefully considered its provisions. The first step in the inception of the Bill was taken by the St. James's Vestry in April last year; and on the 19th of June invitations were issued to all the Metropolitan Local Authorities, with the exception of Woolwich and the Corporation of London, to attend a conference on the subject of the Metropolitan Water Supply. The reason for not inviting the two bodies he had named was that the Corporation of London were themselves engaged in holding an inquiry on their own account, while Woolwich was on the outskirts of the Metropolitan area, and had not the same interest in the water question as the Metropolis proper. The Woolwich Local Board had since petitioned in favour of the Bill. At the conference referred to, a resolution was unanimously passed that, in view of the fact that the then approaching quinquennial valuation would increase by a large sum the value of the property of the Water Companies, the Government should be requested to forthwith introduce a Bill to enable the London County Council, or some other representative body, to acquire the water undertakings by agreement, or, failing agreement, to create a Board of Arbitrators to settle the terms of the transfer under compulsory powers, or to give power to establish an independent supply. A deputation waited upon the President of the Local Government Board, who could not see his way at once to take up the question as a Government one.

Mr. RICKARDS: Since then some change has taken place in the attitude of the Vestries. Could you give us briefly their present attitude towards the Bill?

Witness said that when the Bill was introduced into the House of Commons there were 17 Local Authorities represented upon the Committee. The total rateable value of those Vestries and District Boards was £15,224,000; and the population represented, according to the census of 1881, was 2,053,066, which, ignoring the City, was more than half the population of the Metropolis. Last week he sent round to the Local Authorities and ascertained that, out of the 40 in the Metropolis, 15 had passed resolutions in favour of the Bill (Shoreditch and Hampstead adding that in their opinion the London County Council should be the authority); eight had passed resolutions adverse to the Bill, principally—in fact, all of them except one—on the ground that the new authority, whatever it was, should not buy up the existing undertakings, but should at once seek powers to obtain an independent and competing supply.

The CHAIRMAN intimated that the examination of the witness should be confined, as far as possible, to the proposals contained in the Bill. They did not want to go any further into the inception of it.

Mr. RICKARDS said he would not trouble to go into the advisability of establishing a central authority, as he understood the Committee took that for granted; but he would ask the witness to state what the Executive Committee considered to be the advantages to be derived from the centralization of administration.

The CHAIRMAN said the Committee did not want any evidence on that point either, as they would take it for granted. What they

wanted was to know what were the proposals of the Bill, and the views of those who promoted it, as to the constitution of the body which was to administer the water undertakings, the particular method of purchase, and so on.

Witness, in further examination, said the Executive Committee had considered, firstly, the desirability of setting up a competing supply; and, secondly, whether or not the authority should be that recommended by Sir W. Harcourt's Committee—viz., a body representative of the whole area of supply. But at the same time, while providing for the establishment of such a body, they should take the opinion of Parliament whether or not the London County Council should be the authority. He proceeded to explain the reasons of his preference for a Trust, representing the area of supply, to the County Council. Speaking approximately, the area of the County of London was 120 miles, and the area of supply proposed by the Bill was about 600 square miles. The population of the County of London was 2,750,000, and that of the area of supply 4,250,000. So that if the County Council were the Water Authority, 1,500,000 people would be unrepresented. As the outer area was rapidly filling up, the disproportion in 80 years' time would be still greater. The rateable value of the County of London was £33,000,000, and that of the area supplied by the eight Companies £38,000,000; so that all considerations pointed to the formation of a body which should represent consumers outside the county. It was quite clear that to attempt to obtain a competing supply would be ruinous to both parties; and therefore they had decided to purchase the undertakings of the eight London Water Companies, and on the advice of their Engineer (Mr. Grover), to seek also a supplemental supply by acquiring the Uxbridge, Rickmansworth, and Leatherhead Companies, the water from whose areas they concluded they could take without injury to the interests of those places. They proposed to confer upon the Trust the monopoly of the supply of water with certain exceptions (which were given in the 49th clause) especially reserving the rights of sanitary authorities. This was intended to apply to such bodies as the Corporation of Richmond; and the promoters were willing to except that town from coming under the monopoly of supply at the hands of the Trust. The whole principle of the Bill was to interfere as little as possible with existing rights and privileges. Referring to the variations of charge in the several districts, he said that it ranged from 4 per cent. in some of the districts up to 7½ per cent. in others; and in the districts where the higher charges were in force, the population was, speaking generally, poorer. The proposed Board of Arbitration would consist of four members—one nominated by the President of the Local Government Board; one for financial purposes, by the Chairman of the Institute of Bankers; one for engineering questions, by the President of the Institution of Civil Engineers; and one for valuation purposes, by the President of the Surveyors' Institution. The Official Arbitrator appointed by the President of the Local Government Board would be *ex officio* Chairman; and, if necessary, he could have a casting vote. These Arbitrators were to be paid for their services. In the compulsory acquirement of properties, it was customary for, but not obligatory upon, Arbitrators to award 10 per cent. for compulsory purchase; and the promoters had left this point open, without giving any instruction to the Arbitrators on the point. No doubt, however, they would consider that the superiority of the security offered to the shareholders would be worth something, if not the whole 10 per cent. They did not propose to admit of any appeal against the award of the Arbitrators, with the view of ensuring greater care in making the award in the first instance, and also in order to save expense. If any of the bodies failed to appoint an Arbitrator, power was given to the Home Secretary to nominate one over their heads. The Bill also provided for the appointment of officers and servants required by the Arbitrators during their sittings, as it was quite possible they might like to employ an expert upon special points; and these officers would receive such salary as the Local Government Board might assign to them.

Mr. RICKARDS: Now we come to the most important part of the whole clause—certainly the most important for those representing the Water Companies—and that is the manner by which the Arbitrators are to arrive at the amount of compensation payable to each Company. Now, first of all, will you explain to the Committee the object of those words "in estimating the amount of compensation payable in respect to the undertaking of any Company, the Board of Arbitrators shall have regard to the value of such undertaking prior to the introduction into Parliament of the Bill for this Act"?

Witness said the word "undertaking" was defined by clause 53 of the Bill, and included lands and everything the Company possessed. The object of the provision was that, first of all, improvident expenditure, or the raising of capital in the interval, was not to be taken into account. Suppose, for instance, a Company, in order to enhance their value, called up capital unexpended, or if they incurred unnecessary expenditure, it would be the duty of the Arbitrators not to take that into account. In the month of January of the present year, the Directors of the West Middlesex Water Company had exhausted their powers by issuing to the holders of stock £50,000 preferential stock at par, the value of which in the market was 130 or 140. Consequently, the Company had made a present to their ordinary shareholders of the balance of £30 or £40; and this, he contended, ought not to be taken into account. He was afraid this particular illustration would be outside the scope of the Bill, because, speaking from memory, the capital was issued immediately before the introduction of the Bill into Parliament. A third object was to prevent any claim being set up in respect to additional income arising from the re-valuation of property which came into force on the 6th of April of this year, the capital value of which he estimated at something like £950,000.

Mr. PEMBER, Q.C., on behalf of the Water Companies, asked that any figures which the witness intended to use should be supplied to the opponents, in order that they might be able to cross-examine him upon them. He suggested that the reason it had not been done, as was usual, was that the promoters had not the money to pay for it.

Mr. RICKARDS denied that it was usual to do so, and resisted the application. He repudiated Mr. Pember's suggestion.

The CHAIRMAN said the Committee would not lay down any broad rule on the question of supplying the figures; but, as far as possible, it was desirable that it should be done.

Mr. RICKARDS (to witness): Is your object to give the shareholders of a Company fair value for their holdings, subject to probable expenditure in the future in the construction of new works and the resort to fresh sources of supply?

Witness said the undertaking was to be valued having regard to those considerations. The Arbitrators were to take into consideration the adequacy of the water supply, the present and future requirements, and also the condition of the works of the Company as a going concern. These instructions would enable the Board of Arbitrators to consider both the interests of the ratepayers and the fair and equitable claims of the Water Companies for compensation. They proposed to create a consolidated water stock for the purpose of buying out the existing Companies, and practically to give an exchange of stock receipts in the case of all shareholders who decided to take the stock. But if they elected to take cash, this was to be provided for them. The value they would receive would be either more or less than the market value of their stock according to the award of the Arbitrators. If the market value was one and a half millions, and the Board of Arbitrators only awarded a million for the compulsory acquisition of the undertaking, the shareholders would be allotted a proportionally smaller amount of the Trust's stock; and the value of the cash they received, if they elected to take cash, would differ in the same degree. As to the security, he knew nothing in the market equal to that which they would possess if they held stock under the Trust. First of all, they would be secured on the whole of the property of the undertakings; secondly, on the water-rates and revenues, representing at the present time something like £1,200,000 a year; and, thirdly, on the local rates of the area, which, as he had said, was four times the size of the County of London.

Mr. BOLTON remarked that surely, if there was an option to take cash, there was no need to discuss the value of the alternative security.

Mr. RICKARDS said they would have to issue the stock as a whole, and throw it upon the market; and he wished to show that because the security was so good the shareholders would be very pleased to accept it, and there would be no need to make any large provision for payment in cash.

Examination continued: The promoters had provided that any deficiency of revenue might be made a charge upon the local rates; but he did not consider that any such resort would have to be made. This clause had been introduced as a mere matter of precaution. The principle was not new.

Mr. RICKARDS: Do you consider that the supply of water to the Metropolis is of at least as great importance as some of the questions in regard to which resort may be had to local rates?

Witness: Yes; the provision of water, I should think, is quite as important as the provision of prisons (laughter); but I do not think they will require to resort to the rates.

Mr. BRISTOWE: Unless you do away with water-rates.

Mr. RICKARDS: Or unless they give up drinking water altogether.

Examination continued: Provision was made for working capital in addition to that required for the purchase of stock; and it was also proposed to create a sinking fund, which was not to extend beyond 80 years. When the normal expenditure had been provided for, it was proposed to appropriate the revenue to the equalization of the water-rates, the improvement of the existing system of water supply, and to the reduction of the charges for water.

Sir A. BORTHWICK asked the witness to explain what he meant by the "equalization of the water-rates."

Witness said it was the removal of the anomalies of which he had previously spoken, and adopting such a scale that a house of £50 value, whether in Lambeth or in Piccadilly, should be liable to the same rate. At the present time, one paid £2 17s. and the other paid £2 4s. He did not propose an absolute equality of charge where the expense of supply was greater, because, of course, the question of high level must be taken into account. Witness then proceeded to explain the electoral system provided for in the Bill; stating that only three members of the Trust would be paid—viz., the Chairman, the Vice-Chairman of Works, and the Vice-Chairman of Finance. The electorate was to be the County Council electors, for the reason that it was the most recently created body of electors, and also because it was the most extended. After the first election, it was to be held on the same day as that of the County Council; and thus the expense of holding different elections would be avoided. The Bill provided for the superannuation of officers and servants of the Companies, based on the Civil Service practice; and the reason for superannuation was that, in the interest of the Trust and of the officers, it was a lenient way of getting rid of gentlemen who had spent their lives in the service of the Water Companies without any compensation at all. The reason for providing for consultative members was that if any question should arise in which the Trust might require the assistance of gentlemen of experience in working the undertakings, it might be expedient that they should have power to call them in to advise on engineering and administrative matters. The consultative members were to be appointed only for the first three years; and they would serve a useful purpose during the transitional period of amalgamating the undertakings. Of course, with engineers coming fresh to the work, they would be at a disadvantage as compared with engineers who had been engaged in it for many years; and the consultative members would be equally valuable, whether the County Council or the Water Trust were the authority determined upon by Parliament. Dealing with Part VI. of the Bill, witness explained in further detail his reasons for preferring a Water Trust, representative of the entire area, to the County Council; adding that, as the Council were opposing the Bill, he did not see how they could force the duty upon an unwilling body. One reason for the provision with regard to the Council being inserted was to avoid postponement for another year if the Committee should say that the Council, being the properly constituted representative body for the essential area, should undertake the duty; and the Executive Committee wanted to be prepared to say that provision was made for it in the Bill, and thus save another year's delay.

In cross-examination by Mr. BALFOUR BROWNE, witness said the scheme was to go on drawing water from the points of intake upon the Thames. The Thames Conservancy had very important duties with

reference to the purity of the water of the river, as well as with reference to the navigation, for which they received a payment of £18,000 a year from the Water Companies. If the Trust continued to take water from the present source, it would still be necessary to have the purity of the Thames looked to; and they would have to pay the Conservators the same sum as this body now received from the Companies. The intention of the promoters was to put in a clause for the protection both of the Thames and the Lea Conservators, and to stand in the same relations to them as the present Companies did. It was not their intention to abandon the Thames as a source of water, but to supplement it by the Rickmansworth and Leatherhead supplies. They would also be bound not to take more from the Thames than the Companies had liberty to abstract. The waters of the River Mole were undoubtedly of importance to the Thames Conservancy from the navigation point of view, but the promoters did not propose to take a drop of water from that river. They had made a new departure in including the Rickmansworth and Leatherhead Companies, upon the advice of Mr. Grover, who, he knew, was the Engineer to the Rickmansworth Water Company, but he did not know if he was also the Engineer to the Leatherhead Company. All the Water Companies had recommended the supplementing of the supply from the Thames by resorting to the chalk or the greensand.

Mr. RICKARDS (reading from the report of the Duke of Richmond's Commission) pointed out that they reported that the Thames supplemented, if necessary, by storing the flood waters from the Lea and water obtained from the chalk south and south-east of London, as well as from the lower greensand, would furnish a supply for London.

Further cross-examined by Mr. BALFOUR BROWNE, witness said the promoters were not proposing to carry out the Commission's recommendations by taking more water from the Lea, as he did not think there was any more to be had. As a geographical question, Leatherhead was not south or south-east of London, but south-west. It was calculated that from 20 to 30 million gallons a day would be obtained from the Rickmansworth district. He knew that one of the objections of the Hertfordshire County Council was that at the present time they were greatly in want of water; but the promoters were advised that they could take what they proposed without doing any injury to the inhabitants of the locality.

Witness was cross-examined at some length by Mr. FREEMAN, on behalf of the County Council, as to the feeling of the Local Authorities and the proposed constitution of the Trust.

Mr. PEMBROKE STEPHENS, Q.C., followed in cross-examination on behalf of riparian owners of lands and owners of mills on the Hog's Mill, the Wandle, and the Mole Rivers. In reply, witness said that the promoters considered it most desirable to have a supplemental source of supply; but it was not an essential part of the Bill. The Leatherhead Water Company might be dropped out—he would not say without injury, but without fatal injury to the scheme. The Leatherhead Company was in no sense a Metropolitan one now; and the special reason for including it was that it joined the Lambeth Company, and could be very easily coupled up with it. From Mr. Grover he understood that they calculated to get 10 million gallons of water a day from Leatherhead; but he did not know what they were raising and distributing now. He knew that the Mole was an underground river, fed mostly from springs, and it came out close to one of the mills represented by the learned Counsel. It was proposed to pump practically 10 million gallons from the springs, if they could get it without detriment to existing interests. They would take exactly the same position as the Leatherhead Company. That Company had power to dispose of surplus water which they did not require for the needs of their own district, and which could be sold without detriment to their own supply.

Cross-examined by Mr. WORSLEY TAYLOR, Q.C., on behalf of the Middlesex County Council and the Corporation of West Ham, as to whether, in regard to the equalization of charges, they proposed to level them up or level them down, witness said he should think that public opinion would never stand the levelling up. He had no idea what they would have to pay for acquiring the Companies; but he had a very good idea as to what they ought to pay. He had considered what the saving of expense would be from the unity of management, and could give figures which were based on the estimate of Sir W. Harcourt's Committee, and also upon the evidence given by Mr. S. Wood at the inquiry held by the Corporation last year. He had not formed any idea as to what the future water-rates might be expected to be. It would depend upon four things—first, the price paid for the undertakings; secondly, the prudence of administration; thirdly, the growth of the districts; and, fourthly, the further capital expenditure that would be required. He had sufficient confidence in the Board of Arbitrators to be established to believe that they would not put a prohibitive price upon the undertakings. He did not think it possible that the result of the arbitrations would be to convince him that it would be better to leave things as they were now. As regarded the Rickmansworth Company, the promoters would stand in the same position as the Company, for they also had power to sell surplus water, provided they did not prejudice the locality. He agreed that the locality had the first claim, and that none of the water now came to London. He was told by Mr. Grover that no existing interest would be prejudiced. He was not aware that the Company had been trying to sell themselves for some time. The promoters had not been approached by the Company as a Company. The undertaking was, in fact, in the hands of contractors, who paid a fixed rate of interest to the shareholders.

Mr. WORSLEY TAYLOR: As you are proposing to take more water in the County of Middlesex, do you see any objection to supplying them with water in bulk, and allowing them to buy the mains?

Witness said he had an objection to that in the absence of further information, as they might derange the whole area of distribution. The matter had been under the consideration of the promoters, and was rejected on that ground. They had consulted all the Local Authorities, and asked for suggestions; and if that was such an important point, why did not the Middlesex County Council put it before the promoters?

Mr. WORSLEY TAYLOR said that would be dealt with hereafter.

On the following day, Mr. Wilkins gave additional evidence; and he was cross-examined on behalf of various opponents of the Bill. On Thursday he was recalled, and further examined; after which Mr. Grover, the Engineer of the Rickmansworth and Leatherhead Water Companies, dealt with the engineering portion of the scheme, and the Committee then adjourned till to-day. The report of the proceedings here briefly summarized will appear next week.

HOUSE OF COMMONS COMMITTEE.

(*Before Mr.* J. GATHORNE-HARDY, *Chairman; Mr.* GAINSFORD BRUCE, *Colonel* HILL, *Mr.* LYELL, *Mr.* LEAKE, *Mr.* MATHER, *and Mr.* STORY-MASKELYNE.)

BRINE PUMPING (COMPENSATION FOR SUBSIDENCE) BILL. GAS AND WATER UNDERTAKINGS IN THE SALT DISTRICT.

The Brine Pumping Bill, the object of which is to provide compensation for owners of property suffering through the subsidence of the ground caused by the pumping of brine, has lately been under the consideration of the above-named Select Committee, who reported upon the measure on Tuesday of last week. The Bill is of special interest to the proprietors of the gas and water undertakings in the salt districts of Cheshire; one of the questions raised therein being whether companies owning these undertakings should be allowed to participate in the benefits proposed with regard to compensation for subsidence. The part of the Bill bearing on this subject is contained in clause 21; and is as follows: The damage for which compensation may be made under this Act shall be damage of any of the following kinds, and no other, caused after the passing of the Act (that is to say): With respect to gas and water mains or pipes, the expense of raising, lowering, diverting, or making good the same; with respect to all other works not excepted from this Act, including the gasometers, retorts, and buildings of gas-works, and any pumping-station, reservoir, or building belonging to any water-works, an amount not exceeding the actual damage, nor exceeding the amount of the expense necessary to restore the same to working order. Provided, as regards every case or matter in respect of which compensation can be claimed or made under this section or under any other provisions of this Act, the compensations shall not in any case whatsoever exceed the amount of the actual loss which, in the opinion of the Board [*i.e.*, the Compensation Board to be established under the Act] has been sustained by the claimant; all circumstances which the Board think material being taken into consideration."

Mr. KENNEDY, Q.C., on behalf of Messrs. Brunner, Mond, and Co., opposed the above clause. He said the question raised therein—viz., whether or not gas and water companies should be entitled to compensation for damage caused to their works by subsidence—was a most important, and at the same time an entirely new one. The compensation fund proposed to be established was so limited that it gave, one might say, a right to the promoters to press for the passing of the Bill; but in the distribution of the fund, it had to be seen that only the right people received payment out of it. The gas and water companies were bodies which were able to protect themselves; and in the particular district in question, they had obtained special powers, because they represented that there were peculiar difficulties in connection with the sites on which their works were placed.

Mr. MARSHALL (for the promoters) said he thought it only went to this extent—that they had power to charge a higher figure than was usual with gas companies, but never received it. They obtained the power on the ground that they were more liable to breakages and leakages than were people in other districts.

Mr. STORY-MASKELYNE: What is the price of gas there?

Mr. MARSHALL: The maximum price is 6s. per 1000 cubic feet; but the actual figure is 4s. 2d.—they never felt at liberty to charge as much as 6s.

The CHAIRMAN: How does this apply in the case of a water company.

Mr. KENNEDY: It would not apply to them. The provision to which I have referred applies to the only Gas Company at work in the district.

Mr. STORY-MASKELYNE: Winsford is lighted with gas, is it not?

Mr. MARSHALL: Yes; but without parliamentary powers.

Mr. MELLOR: The Local Board are the owners of the water-works but the Gas Company is a separate undertaking.

Mr. KENNEDY proceeded to say that in the case of Northwich, the neighbourhood in which Messrs. Brunner, Mond, and Co.'s principal works were situated, the water supply was in the hands of the Local Board; and they were able to charge rates in accordance with the requirements of the undertaking upon which they entered—making their calculations as to profits and contracts upon the basis of the risk through subsidence. Therefore there was no injustice at all in assuming that they had taken all these facts into consideration, and were themselves actually in a position, as in the case of the Gas Company, to get a higher rate because of the risk to their foundations. What he had to submit to the Committee, as a very important matter for their consideration, was that they must look to the classes upon whom they really meant to confer the benefits of legislation. There could be no doubt that gas and water companies obtained a distinct profit; they had their own special protection, and had no right to say: "We are put in a worse position than we thought we should be when we started, and therefore we ask for redress." He submitted that they obtained almost as much advantage as a brine pumper or an alkali manufacturer; and on this ground they might fairly be excluded from participation in the compensation for subsidence.

Mr. PEMBROKE STEPHENS, Q.C., on behalf of the Northwich Gas Company, said he was surprised at the proposals of Messrs. Brunner, Mond, and Co., because, whatever might be the profits of the Gas Company, the firm had taken good care statutorily to keep the profits to themselves, because, at the time when the Company were before Parliament, Messrs. Brunner, Mond, and Co., insisted upon the insertion of a clause, reserving to themselves the right to make gas, and get profits for themselves out of their own gas manufactory. The clause was as follows: "Nothing in this Act contained shall operate against or affect the right of Messrs. Brunner, Mond, and Co., Limited, from

manufacturing and supplying gas for the purposes of their works and for the supply of their tenants on land now belonging to Messrs. Brunner, Mond, and Co." Their profits for gas might appear small by the side of their brine profits; but the Gas Company certainly did not expect an attack from that quarter. If further evidence had been called before the Committee, they would have had two gentlemen from Droitwich and also the Manager of the Gas Company at Northwich, who would have been prepared to speak as to the amount of depreciation which had occurred in consequence of the subsidence there; but, owing to the course which the inquiry took (of which he did not complain), the Committee had not had put before them the case of the Gas Company as to the extensive and unusual amount of subsidence in this district, which was found to be out of all proportion to what took place in many towns that could be mentioned in the same category. He would remind the Committee that in the case of gas companies there was a well-recognized proportion of leakage, or gas unaccounted for; and if it went beyond the standard, it would be regarded as something wholly unaccountable. In the district with which they were dealing, as one might expect from the circumstances of the case, the leakage was out of all proportion; and for this, under the scheme of the Bill, the Gas Companies would get nothing. The modest proposal, and the just proposal, of the Bill was that compensation should be paid in respect of gas-mains and "the expense of raising, lowering, diverting, or making good the same." Every possible precaution that could be taken with regard to the exceptional conditions of working of the Company had been resorted to—even to the use of india-rubber joints; so that, if the pipes should be deflected or strained, there would not be an immediate escape of gas. But, in spite of this, an utterly abnormal loss had gone on. Under the scheme of the Bill, it was not proposed to pay the Company a penny for loss of gas. All it did was to provide that the moment any breakages occurred—due, be it remembered, to no cause of their own, and against which no precaution on their part could safeguard them—the money should be found for putting things straight. His learned friend had talked about the security which the Company were supposed to have under their Act. Well, all they had was this: "The price to be charged by the Company for gas, having regard to the increased cost of supply by reason of the natural subsidence of the surface of the ground within the limits of supply, shall not at any time exceed 6s. per 1000 cubic feet." That was an utterly impossible maximum; and if the Company had attempted to charge it, they could not have done so. In these days, as every one knew, there was fierce competition with oil and in other ways by gas companies; and the cream of their business, over one part of the district had been taken off by Messrs. Brunner, Mond, and Co., and the Company were left with the rest, subject to these special circumstances. Clause 21 of the Bill provided nothing more than that, if subsidence occurred, the expense of restoration should be paid out of the compensation fund; but what his learned friend wanted to put upon them was that under no circumstances whatever should they get a penny. This seemed to him to be extremely unfair; and the unfairness was shown when one came to look at the clause put forward on behalf of Messrs. Brunner, Mond, and Co., by which it was proposed to exclude gas and water companies, but which did not exclude a water undertaking when it had passed into the hands of a local authority. He would like to know what difference in principle there was between a gas undertaking in the hands of a local authority and in the hands of a company. The subsidence was exactly the same.

Mr. STORY-MASKELYNE asked if the Northwich Company paid any dividend.

Mr. PEMBROKE STEPHENS said they did; but it had never been the amount they were authorized to declare.

Mr. STORY-MASKELYNE: And they charge 4s. 2d. per 1000 cubic feet for their gas?

Mr. PEMBROKE STEPHENS said that was so. It was pressed against them that they might charge 6s. They were authorized to pay a dividend of 10 per cent.; but they had never done it, though they had worked consistently in the face of great difficulties. The shares of the Company were largely held by people in a humble position in life, to whom the receipts were a very important consideration.

The CHAIRMAN: Supposing the Committee were disposed to allow the gas and water companies to have compensation, how are you to prevent them from laying down mains all over the town, or spending any amount of money upon them and putting them in good repair, at the expense of the Compensation Board?

Mr. PEMBROKE STEPHENS: So far as leakage goes, that is eliminated.

The CHAIRMAN: Supposing they had their mains laid in a street, and had gone on using them although they were not in a very good state of repair, and then supposing the street went down, if they could come upon the Compensation Board for this, they might say, "We must take up the whole street, and lay fresh mains." How are you going to deal with such a case as that?

Mr. PEMBROKE STEPHENS: I take it that the Board would, in the case of all claims coming before them, be obliged to exercise their discretion, and say: "If you are going to make a claim, it must not be an unreasonable one." You would make it subject to any reasonable control, no doubt. The Northwich Local Board have spent something like £45,000 compulsorily in supplying their district, and supplying it properly, with water; and some five or six miles of pipes run through their district, which is of a somewhat shaky character. Is damage to be done at any moment to these pipes, and no provision to be made for the restoration of them?

Mr. FREEMAN, on behalf of the Winsford Local Board, who own the water undertaking, said that, in the hands of the local authority, he could not see that there was practically any difference in the position whether it was a question of a pipe used for conveying water for the inhabitants and for sanitary purposes, or whether it was a pipe conveying sewage, which was equally for sanitary purposes; and if they were in the same position, clearly the local authority was brought under the provisions of the Public Health Act of 1883, which was passed in order to set at rest various doubts which had been raised as to the right of a local authority to the support of their pipes, as well as to do away with difficulties which had arisen in the Courts of Law in consequence of two sets of decisions—one given in the Dudley case, to the effect that, the moment the local authority put their pipes down, they were entitled to support, and therefore must pay for the right of support; and the other given in the conflict between the Metropolitan Board of Works as to their main sewer and the Metropolitan District Railway Company, where the contention was that the local authority had no right of lateral support, and therefore that anybody might take away that support, and let down their sewer or pipe without their having any remedy. In order to overcome the difficulty, the Act of 1883 was passed, which specified that the local authority should not, by the mere fact of laying their pipes, have a right to support for them, but that they might give notice to the owner of minerals underneath them of their desire to have certain support, restricted, and not extending necessarily so far as the right to support under the Railways Clauses Consolidation Act. On giving this notice, they had to purchase the minerals, secure the interest of the owner, and then they had a right to support for all time. But there was this difference between that case and the present one: There was underneath, and if not purchased it would be worked away, the solid material in the mine.

The CHAIRMAN: That is the old question, of course, whether it is solid material or brine; and this you cannot follow.

Mr. FREEMAN said, without going over old ground, there was this difficulty—that in the case of the solid mine there was something which, if the sewer burst, would flood them out, and cause them an immense amount of mischief; so that they were bound, for their own self-protection, to work the mine so as to cause the least possible injury to the owners of the pipe. Whereas in the case of the brine pumpers, it did not matter to them what happened; for if the pipe sank and burst, it would not effect them. Then came the point that the clauses of the Bill could not actually be put in force against them, because it could not be said precisely that they were the owners of the thing which was being taken away. Therefore they were left in this position—that unless they were allowed, as a public authority, as regards their sewer-pipes and their water-pipes, to come under the protection of the clauses, they would be unable to put in force, in one portion of a mining district, a Public Act which was passed in 1883 for the protection of the local authorities in mining districts, and they would have to be constantly repairing their pipes, &c., at the expense of the ratepayers, a very large proportion of whom were poor people, who could ill-afford to pay an increase of rates. In these circumstances, he submitted that what they were asking the Committee to do in the present case was simply to extend logically the policy of the Act of 1883, so as to enable them to receive compensation if a mine-owner, by careless and negligent working, let them down in such a way as to cause this injury over which they had no control.

At the conclusion of the arguments, the room was cleared. On the re-admission of the public,

The CHAIRMAN stated that the Committee had come to the conclusion that gas and water companies should be excluded from compensation under the Bill.

Presentation to Mrs. Marshall.—Before the close of the gas exhibition at Exeter (which was noticed at length in the JOURNAL last week), Mrs. C. Marshall, who delivered the cookery lectures, was presented by the Directors of the Gas Company with a very handsome crescent-shaped brooch, which can be also used as a hair-pin. In the centre is a star of diamonds; the surrounding crescent being studded with pearls.

The Stockton Town Council and their Gas Workers.—The *Northern Echo* says that "the Stockton Trades' Council are naturally not disposed to allow the gas workers' question to rest where it is. They are promoting petitions, which have been numerously signed, inviting the Mayor to call a town's meeting to discuss the action of the Gas Committee in declining to meet a deputation on the subject. This request will place the Mayor in rather a delicate position, for he is a member of the Committee whose conduct is called in question."

Electric Lighting Accidents in Paris.—Owing to the occurrence of several serious accidents through the extension of electric lighting in Paris, the Municipal Council have given instructions for a complete list to be prepared, with an indication of the probable causes; and the whole matter will be investigated by a Commission. Since September, 1889, no less than 18 accidents have occurred—some, it is true, not of a serious character. However, in the interests of public safety, it is deemed advisable to have an inquiry. These mishaps do not appear to bring the light into disrepute with the authorities, as the Municipality have just renewed for ten years the contracts for the lighting of the Boulevards.

The Salford Gas Frauds.—The *agenda* before the Salford Town Council last Wednesday contained the following motion in the name of Mr. Holland, Chairman of the Gas Committee, but in his absence it was withdrawn, Mr. Phillips, the Deputy-Chairman, remarking that it was "premature": "That, in the opinion of this Committee, the sum of £9278 19s. 4d. standing to the credit of the borough fund, being the net balance of the amount received in connection with the gas frauds, should be transferred to this Committee, in order that the same may be divided among the three districts of the borough, in the same proportions as the gas profits are apportioned, and that the Council be recommended to confirm the same."

Gas-Meter Testing in Manchester.—A special meeting of the Manchester City Justices was held last Tuesday (Mr. T. H. Lowthian, J.P., in the chair) to receive and take into consideration the annual report of the City Official Inspector and Tester of Gas-Meters (Mr. James Urquhart, who was appointed under the Sale of Gas Act) for the year ending March 31 last. The report stated that during the year 10,675 meters had been tested, of which 8197 were wet and 2478 dry; the fees charged amounting to £406 15s. 7d. Compared with the previous year, there was a decrease of 790 meters, and an increase of £39 13s. 7d. in fees; the latter being due to the greater number of large meters tested. The excess of expenditure over receipts amounted to £332 18s. 7d. The percentage of rejected meters was 4·26, chiefly old and repaired; whereas in the previous year it was 3·73. Rejected wet meters showed an average of error of 5 per cent. fast or 5 per cent. slow; dry meters, 5 per cent. fast or 16 per cent. slow. The total of meters tested since 1862 is 271,062; and the fees charged £16,519.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Thursday, May 7.

(*Before Mr. Justice* VAUGHAN WILLIAMS.)

Wenham Company, Limited v. The Champion Gas-Lamp Company, Limited, and Todtenhaupt.

This was an action to restrain an alleged infringement of the patent for the well-known Wenham lamps.

The ATTORNEY-GENERAL, Mr. ASTON, Q.C., Mr. MOULTON, Q.C., and Mr. LEMSON appeared for the plaintiffs; Mr. MORTON DANIEL and Mr. JENKINS for the defendants.

The ATTORNEY-GENERAL, in opening the case, said it did not involve any minute questions of science. He should not take long in opening it; for having very carefully examined the papers, he was really unable to see what defence there was to it. The invention related to improved gas-lamps. There having been for many years a number of attempts to improve the combustion of gas, Mr. Frank Clark's invention (which now belonged to the Wenham Company) related to a combination and mode of arrangement of the air passages in a closed lamp, which combination had in fact been taken bodily by the defendants. Subject to anything his learned friends might say, he was unable to see any material distinction between the two. He then explained, by means of a diagram and a lamp in section, the construction of the plaintiffs' lamp, with the central gas-tube, the air passage surrounding it (through which the air was conveyed to the upper surface of the flame), and the outer cylinder through which the products of combustion passed off. In so doing both the gas and air supplied to the burner were heated; and this necessitated an arrangement for admitting cool air round the margin of the glass globe to the under surface of the flame. A diagram and section of the so-called infringing lamp were also exhibited, showing the same construction. He then read the specification of Clark's patent, No. 2869 of 1881. He was instructed that this was really the first successful suspension lamp in which heated air was supplied to a ring burner. Four of five specifications and two prior publications were put forward by the defendants in their particulars of objection; but he should leave any comment upon them until he heard what case was made for the defendants.

The specification of the patent and the assignment to the plaintiffs having been put in,

Sir *Frederick J. Bramwell* was called and examined by Mr. ASTON. He said: I have devoted considerable attention to the subject of gas lighting; and have read the amended specification of Mr. Clark's patent. It is sufficiently intelligible to enable the invention to be carried into effect. The lithographed drawings are very obscure; but the deposited drawings are quite sufficient. There are two modifications; but in each there is a supply of air heated by the products of combustion, and of cooler air coming from the rim of the glass. With regard to the second modification, I find that in this lamp, being a pendant lamp, the gas is brought in by a central pipe that terminates at the bottom in a radial circular burner; the orifices being so arranged as to project the gas horizontally and produce a flat circular flame. It is necessary to supply the gas with a certain amount of air. (The witness then described the manner in which the air to the upper surface of the flame is supplied, being heated by contact with the walls and the chimney, and ultimately passing out through a diaphragm on to the upper surface of the flame. The drawing indicated that there was a diaphragm; and the arrows showed there were perforations through which the air passed.) The inlet of air round the glass bowl was then described. The heating of these last currents would be inconsiderable. The construction of the chimney or flue was then explained in detail by reference to the diagrams, its action being to draw in the air to feed the flame.

Cross-examined by Mr. DANIEL: Assuming that, at the date of Clark's patent, the mode was known of constructing a lamp by a central gas-pipe, with a tube surrounding it to convey air, and another tube outside again for carrying off the products of combustion, the only novelty in the patent would be the particular combination. There might be other combinations coming within the same specification. There were some slight differences of form in the defendants' lamp; but he did not consider them material. The annular chamber for the air in the defendants' lamp was much larger than in the plaintiffs'—probably treble the size; but it had the same effect. The exterior chamber in the plaintiffs' lamp did not exist in the defendants'. The proportions of the various parts differed in the two lamps. He thought the defendants' would be less effective in the open air in a strong wind; but probably equally effective in a room. Witness was then cross-examined at some length on the details of the drawings. Reading the plaintiffs' specification, he said, it seemed to suggest that a portion of the heated air came through the perforations to the surface of the flame. The model or drawing did not show any aperture through which the other portion would pass. It only said "if desirable;" and he understood this to mean that if the gas were smoky and more air were required, perforations might be arranged above the diaphragm as well as those in the substance of it. In the model of the plaintiffs' lamp made by defendants, the lower end of the air tube was open; and there were apertures in it, a little above the bottom, through which some air would probably pass, but not much. He thought that it more accurately represented the specification than the plaintiffs' model, taking the letterpress of the specification alone; but it was not consistent with the drawing, as it had not the perforated diaphragm which was clearly shown in one of the drawings. He was well acquainted with the principle of regenerative gas lighting. It was not first drawn to his attention by an article written by Mr. F. Siemens; he thought it was by a lamp invented by Mr. Werner Siemens. He could not give the date. Regenerative furnaces were first brought to his attention 25 years ago. The benefit of heating the air feeding a gas-flame was not the same as the heating of a hot-blast furnace. He knew the patent of Mr. F. Siemens; and had read the article on the subject in the JOURNAL OF GAS LIGHTING of June 13, 1880, describing the invention. He was then taken through the details of the drawings illustrating the article referred to. These showed a concentric tube and an air supply heated by the products of combustion. The general appearance was similar to that of Clark's patent. The second arrangement showed a hanging lamp; and so far it was similar to the plaintiffs'. The air was excluded from the inner surface of the flame by a reflector or cone. The first arrangement was different, in not being a pendant lamp; and it required a separate chimney. Then there was no supply of cool air to the interior of the glass. He did not know whether a radiating burner was an essential feature of Clark's burner; but he should think so, because other burners had been disclaimed. The drawings showed a burner of larger diameter than the bottom of the tube; but he did not know that this was essential. The impulsive force of the gas would carry it beyond the tube. An ordinary Argand burner was a circular burner, but not of the kind shown in the drawing. He did not think an Argand burner could be fed with hot air from above; it would probably smoke. The burner drawn showed nipples; and he did not know whether it was different from those now used by the plaintiffs. The differences between the plaintiffs' and Mr. Siemens's second arrangement were also considerable—namely the flame was vertical, and not horizontal; there was no supply of air to the upper surface of the flame; and there was no secondary supply of air to cool the globe.

Friday, May 8.

On the hearing of the case being resumed this morning,

Sir *F. Bramwell* was further cross-examined by Mr. MORTON DANIEL. Witness's attention was first called to an article in the *English Mechanic* of March 11, 1881, entitled "A Hygienic Lamp," describing a regenera tive and ventilating burner. He said he did not consider this descrip tion conveyed to the mind of an instructed reader an adequate idea of the construction of Clark's lamp. A lamp made by a workman from the description in the publication named was then put before witness, who said it differed from the description in respect of the burner. He had also made holes for the admission of air to cool the globe, which were not suggested in the article; otherwise it was not inconsistent with the article.

His LORDSHIP here remarked that, having listened attentively to the opening and to the evidence, he had hitherto failed to gather what were the important features of the combination which were claimed. He understood on the previous day that one of the most important points was the radiating burner. He believed a radial burner was not new in the year 1880.

The ATTORNEY-GENERAL said he agreed with that.

Cross-examination continued: Brooman's specification was next put to the witness as an anticipation. Air was there brought in through perforations and passed round the globe, cooling it, and being itself heated by contact with the chimney. Plaintiffs' specification was next introduced. In this case the air went in two currents—one through the burner, and the other outside it. Wright's specification came next, for heating burners. Here the air was admitted through perforations; each jet having its own air supply. The elements of the plaintiffs' combination were, in witness's opinion, these: A tube for the admission of air inside (or it might be outside), and a tube for the exit of the products of combustion, so as to cause the air to be heated on its entry into the lamp. This air was to be directed downwards on to the top of a flame produced by a number of jets of gas running from a circular burner in a horizontal direction—the burner being situated in an appropriate position below, and in the centre of the heated air inlet. Then the admission of a second current of air to cool the globe, and to be directed on to the under surface of the flame; this cool air to be admitted through small holes, and the heated air through a perforated diaphragm. As a matter of choice, the constructor might, if desired, make holes in the side of the lower portion of the air-inlet tube. He did not think any of these elements were new at the date of Clark's patent. The division of air into two inlets, above and below, was probably not new. Air entering through perforations was also old. He did not know as to a radial burner in connection with these elements.

The ATTORNEY-GENERAL submitted that the particular anticipation suggested ought to be put to the witness. His friend could not go beyond the particulars of objections.

His LORDSHIP said he thought the general question as to novelty having been put, Counsel was entitled to cross-examine generally. He would look at the shorthand notes, and see what was the question put in examination-in-chief. Having referred to the notes, he said the question was in a limited form; and Mr. Daniel could not therefore go beyond his particulars of objection.

Mr. DANIEL submitted that his questions came within the particulars of objection. It had been held that where public knowledge was pleaded, it was not necessary to refer to all books and publications containing that knowledge. However, he did not desire to pursue the matter further.

Re-examined by Mr. ASTON: The enumeration of the elements of the plaintiff's combination, as above stated, having been read by his Lordship from his notes, certain verbal emendations being made by the witness, his attention was called to the article in the JOURNAL OF GAS LIGHTING describing Siemens's lamp. Fig. 1 did not contain the same combination as that he had just described; the plaintiffs' lamp was a pendant one, which he should have added to the description above. The differences were those he referred to on the previous day as also with regard to fig. 2—notably the prevention of the access of air to the upper side of the flame, and the absence of a second current of air. This latter point was very material; Mr. Siemens pointing out the danger of the glass cracking. With regard to the "Hygienic" lamp, the description was too vague, in the absence of a drawing, to convey definite information. There was nothing pointing to a radiating burner, but rather the contrary. The model said to have been made in accordance with the description had perforations round the rim for the second current, which were not referred to in the articles; and a person only going by the description would probably avoid making such perforations, for fear of interfering with the pull of the chimney. Mr. Siemens did not do it; and the description referred to said nothing about it. The burner was inconsistent with the description in regard to Brooman's specification; it showed a lamp quite different from the plaintiffs'. In plaintiffs', he saw no means of heating the incoming air by the products of combustion, which made it quite a different character of lamp. Wright's specification simply provided

for each jet of gas getting its own supply of air through a tube as distinguished from the general body of the atmosphere.

Justice VAUGHAN WILLIAMS: Could you give me the meritorious character of this combination as distinguished from an enumeration of its features, many of which you have said were not new?

Witness: The inventor has so designed his lamp that he applies heated air to a flame peculiarly calculated to receive it, and to a part of the flame where it is best applied; and notwithstanding that he has a lamp with a strong draught in it to produce a downward current of heated air, which naturally tends to go upwards, he has nevertheless a secondary current which preserves the lamp, and in these ways has produced, so far as I know, a new combination of useful character.

In reply to further questions, witness said the main features of merit were the application of the system described by Mr. Siemens to horizontal jets, so as to make the heated air more effective, and the application of the second current. It was true that air had previously been supplied to gas-burners, both above and below; but he did not know a case where hot air was supplied above, and cool air below.

By the ATTORNEY-GENERAL: The gas as well as the air was heated on its passage to the burner in the plaintiffs' lamp.

Dr. *J. Hopkinson*, F.R.S., examined by the ATTORNEY-GENERAL, said he had carefully considered plaintiffs' specification, the infringement, and the particulars of objection. The specification described two modifications, and special means were provided in each for heating the incoming air and gas by means of the outgoing products of combustion. This was not new; but it was meritorious. Such a lamp was liable to unduly heat the glass; and the patentee provided a second current of air which kept it cool. This was new. He did not know any previous instance of a cold current of air in conjunction with a hot current. The distinctive features of the second modification described were that the means provided for heating the air and gas were these: Causing them to pass down a tube inside the chimney; the air-tube leading to a continuation adapted to direct the incoming air on to the inner or upper surface of the flame produced by a burner of a particular kind. The description seemed to him perfectly clear, and to indicate that a portion of the heated air might, if found desirable, pass through the sides of the tube a short distance above the diaphragm. That portion of the heated air would pass up the chimney; but it might impinge on the upturned points of a cup-shaped flame. He had made two rough sketches representing the two modifications.

By his LORDSHIP: He could not say which portion of the air was applied more equally to the flame, as the specification stated.

By the ATTORNEY-GENERAL: It was no doubt desirable to heat the gas as well as the air; this was done by Mr. Siemens. He had examined the infringing lamp; it was the same combination as described in plaintiffs' second modification. It had the descending gas-tube which would be heated by the products of combustion. It was surrounded by an air-tube, which was carried down by a continuation through which the heated air was conveyed to the upper surface of the flame. There were also provided holes round the rim, for admitting cool air to the lamp and to the under surface of the flame. It was precisely the same combination as that of the plaintiffs'. In none of the particulars of objection, nor in all combined, did he find the same combination. He agreed with Sir F. Bramwell's evidence with regard to the anticipations.

Cross-examined by Mr. DANIEL: All the elements of the combination were found separately in the alleged anticipation, except the ring burner (which was old) and the continuation of the air-tube. The great merit of the invention was the introduction of the second current of cool air, which was by no means obvious. In Brooman's there was the introduction of cool air, but not in combination with a heated current of air or gas. The air would be very slightly heated in its passage inwards. A railway carriage lamp—an oil-lamp with four burners—was then put before the witness.

Mr. ASTON objected to this lamp as not being in the particulars of objection.

Mr. DANIEL said this was a lamp actually in service many years ago, not set up as an anticipation of the combination, but as showing that a double current of air was in use—this combination of two currents not being claimed.

After a short discussion, the evidence was admitted.

Witness said he did not find two independent passages for the entry of air. There was one entry; all the rest, he thought, being exits. Another railway lamp was shown to witness, who again said he could only find one entry for air.

Mr. ASTON suggested that two supplies of air were immaterial if they were not utilized in the same manner as the plaintiffs'. He asked his friend if he could prove that this identical lamp was manufactured before the date of the patent.

Mr. DANIEL said he could prove that lamps identical with it—not that particular lamp—were.

Witness again examined the lamp, and ultimately said there were two passages for the air to go to the burner; but it would not be materially heated. So far as they were affected at all, both currents would be heated equally. Apparently the object was not to supply heated air to the burner. There were minute differences of form between the plaintiffs' lamp and that of the defendant. In the plaintiffs' there was an additional chamber, which made it more suitable for outdoor use. In defendants' there was a casting; in the plaintiffs there were two concentric tubes brazed together. The defendants' also had star-shaped pieces, which would assist in heating the incoming air. A burner of the class described in plaintiffs' specification was essential to the invention. It must be a radial burner; but the diameter must vary within wide limits. In the drawings, the diameter of the burner exceeded that of the continuation of the air-tube. There must be a space before the end of the continuation and the burner for the air to issue from. The drawings clearly indicated a perforated diaphragm, and also horizontal apertures just above, which must be made if deemed to be advisable. He could not say what would make such openings desirable; it must depend on the quantity or the quality of the gas supplied, or on the size of the burner. The perforated diaphragm was a very important element. There was nothing in the letterpress to describe it; but it was plainly indicated by the drawing. He did not think the plaintiffs' lamp would work with an Argand burner, or with any burner with a vertical flame. Apparently the inventor thought it could be done by his specification.

Re-examined by Mr. ASTON: In a case of this kind, he paid more attention to the drawing than to the letterpress. Here the drawing in fig. 5 was quite sufficient for a workman, and free from ambiguity.

The ATTORNEY-GENERAL suggested that there was no question raised as to the sufficiency of the specification.

By Mr. ASTON: If the lateral perforations were not made, the air would come down on the upper side of the flame; if they were introduced, a portion of the heated air would impinge on the edge of the flame, and would thus be more equally distributed. The casting in the interior of the defendant's flame was not substantially different from the plaintiffs' arrangement. The addition of the star-shaped pieces only increased the heating surface; it did not affect the principle.

Mr. *Frank W. Clark*, the inventor of the lamp in question, was the next witness. In examination by the ATTORNEY-GENERAL, he said the merit of the lamp lay in the combination, not in any particular element by itself.

His LORDSHIP remarked that he had not seen the actual lamp.

The ATTORNEY-GENERAL said he was bound by the specification; and the plea of utility not being in issue, he could not put in the lamp or prove its utility.

Examination continued: The merit of the lamp consisted in bringing hot air on to the surface of the flame, heating it by the products of combustion, and providing a second current of air to keep the glass cool and supply the under side of the flame. He also attached importance to the heating of the gas. He found no anticipation of his combination in any of the instances adduced. He was the true and first inventor of the lamp in question. The same combination of parts appeared in defendants' lamp; and the functions they performed were the same.

Cross-examined: He assigned the patent to the Wenham Company six or seven years ago. Previously to that, some lamps had been made experimentally but none sold. They were constructed, exactly in accordance with fig. 5, for railway purposes. On witness being asked if the air-tube in those lamps was not open at the bottom,

The ATTORNEY-GENERAL objected. The sufficiency of the specification had not, he said, been challenged; and it was not affected by an improvement subsequently introduced. He had no objection to the question being answered, if his Lordship desired, for the sake of information.

Mr. DANIEL said the question arose in consequence of what had come out in the evidence as to the perforated diaphragm.

The ATTORNEY-GENERAL said he only wished his objection recorded, because he did not see that the point was in issue on the pleadings.

Cross-examination continued: In the lamps so made, experimentally, some had a perforated diaphragm and others not. The drawing he prepared himself from a lamp he had made. It had lateral perforations, and he stopped them up, as he found them unnecessary. He knew Messrs. Ridsdale, of the Minories. They might have had a lamp without perforations at the bottom. The Wenham Company had made lamps exactly in accordance with the specification in fig. 5, with the exception of the wind-guard; and some they made with this for outside work. A section of an actual lamp as now made was produced. The burner was different in shape from the one shown in the drawing, but it was the same kind. He believed the burners came from Germany; they were not Sugg's burners. He had originally, to use a burner with nipples, because the solid steatite burners were not then available. This necessitated having a burner of large diameter, in order to get the requisite quantity of gas through. The lateral perforations were put in to get more air to the flame, as he was using a rich gas.

Re-examined: The wind-guard was required in the open air, to guard against draughts. He at first granted a licence to Mr. Sugg; but he re-purchased it when he sold the patent to the Wenham Company, for which he had received a large sum.

The ATTORNEY-GENERAL said this was the plaintiffs' case.

Mr. DANIEL intimated that he would call his witnesses before addressing the Court.

Witnesses were then called in support of defendants' case; and their evidence lasted nearly the whole of the remainder of the day. Just before the rising of the Court, Mr. Daniel commenced his address, but had not concluded it when the time for adjournment arrived.

On Saturday Mr. Daniel resumed his arguments on defendants' behalf, and was followed by Mr. Jenkins. The Attorney-General then replied on the whole case; and Mr. Justice Vaughan Williams thereafter intimated that he would reserve judgment. This is to be delivered to-morrow; and a full report will appear next week.

Northern Coal Trade.—Greater activity has marked the coal trade of the North during the past few days; the inquiries from Holland and Belgium having increased, owing to the numerous strikes in the latter country. The demand for best Northumbrian steam coals is above the capacity of the collieries to supply; and for ready coal, when procurable, higher prices have been asked. For best Northumbrian steam coal, from 12s. 6d. to 13s. per ton, free on board, is asked; and the former of these prices has been paid, though large quantities are being delivered on contract at much lower rates. For second-class coals, from 9d. to 1s. less is asked; and small steam coals are firm at about 5s. 3d. to 5s. 6d. For gas coals the demand is large, both for home use and for export; but the price varies much. About 9s. 6d. to 10s. per ton, however, is the current quotation. Part of the contract for gas coals for The Gaslight and Coke Company has been allotted to Sunderland shipping collieries. It is said something like 400,000 tons have been so placed; but the statement is not yet verified, nor is the price known, though it is currently reported to be much less than the last contracts entered into. It is believed to be less than 9s. per ton. Manufacturing coals are rather easier; some of the shipbuilding yards having less work on hand. Coke is slightly steadier; and for best blast-furnace kinds about 17s. per ton, free on board, is quoted. Gas coke is unchanged. Altogether, the fuel industries in the north-east of England are extremely brisk; and a full demand and higher prices are general.

MISCELLANEOUS NEWS.

METROPOLIS GAS SUPPLY.

Recent Appeals to the Chief Gas Examiner.

In the matter of the appeal of the SOUTH METROPOLITAN GAS COMPANY *against the report of the Gas Examiner at the Blackfriars Road testing-place, showing deficient illuminating power in the gas supplied by the Company on Jan. 2, 1891.*

The appeal was lodged within seven days after the day on which the report was made. At the hearing which I gave to the parties in this appeal, Mr. F. Livesey appeared for the Company; Mr. Dibdin for the County Council.

The Company did not dispute the validity of the testings, although they stated that their own test showed a higher illuminating power in the gas sent out from the works.

They could not discover any explanation of the deterioration of the gas, but referred to the untrustworthy character of the candle as a standard of light.

The Gas Examiner's report must be accepted.

(Signed)
March 14, 1891. ALEX. W. WILLIAMSON, Chief Gas Examiner.

In the matter of the appeal of THE GASLIGHT AND COKE COMPANY *against the report of the Gas Examiner at the Spring Gardens testing-place, showing deficient illuminating power in the gas delivered by the Company on Jan. 10, 1891.*

The appeal was lodged within seven days after the day on which the report was made. At the hearing which I gave to the parties in this appeal, Mr. Dibdin appeared for the County Council; Mr. Trewby for the Company.

The Company stated that their own test showed about 0·8 candle higher illuminating power than was shown by the official tests; but they considered that this was accounted for by the manner in which the candles were used, as explained in recent hearings.

They stated that, during the cold weather, they had used much more cannel than usual, and had contracted for additional supplies, but that the contractors had been unable to send the supplies as fast as they had undertaken to do so. In this manner the stock of cannel coal at the Company's works fell from 7000 tons in December to 102 tons—less than one day's consumption—on the 8th of January.

The Company gave evidence that they did their utmost in urging the contractors to send the supply more promptly. It appears that these delays were owing to the Scotch strike, which had been going on since the 22nd of December.

Further difficulties were occasioned by the action of the Trades Unions in relation to a special process for improving the gas which the Company wished to resort to.

It appears to me that the Company did what they could to keep up the proper quality of the gas, and that their failure to do so was occasioned by the unavoidable cause of which they afforded evidence.

(Signed)
March 21, 1891. ALEX. W. WILLIAMSON, Chief Gas Examiner.

THE APPROACHING GAS COAL SEASON IN LANCASHIRE.

The prices which are likely to rule for gas coal during the ensuing season are necessarily just now occupying a great deal of attention; and the question would seem to be surrounded with considerable perplexity as regards both buyers and sellers. Last year colliery proprietors were able to hold out for a considerable advance upon the prices that were taken during the preceding season; and as there is no indication that the present high rate of wages, the advance in which was the main ground of the increased prices obtained last year for gas coal, is likely to undergo any material change, at any rate during the present year, there would appear to be no great probability of much lower rates ruling this season. That colliery proprietors will not willingly give way upon last year's figures may, of course, be taken for granted; and in their efforts to maintain prices, they are certainly being most efficiently assisted by the men. Indeed, it may be said that colliery proprietors in many cases are not only recognizing, but openly admitting that the miners have shown themselves much better able to regulate market prices than they are themselves, and that but for the united action taken by the men with regard to wages, prices could not have been brought up to their present level. So far the exceptional severity and long duration of the winter have strengthened the position of colliery proprietors in holding to their rates; and they are commencing the summer in most cases almost bare of stocks. The declining off in many cases in the principal coal-using industries tends, however, to give an undercurrent of weakness with regard to the future; but the men are evidently determined that there shall be no large accumulation of stocks which shall tend to lower quotations, and at the same time bring down their wages. So that, what with the absence of stocks and a restriction of the output, any falling off in the demand for coal for general manufacturing purposes may, to a very considerable extent, be counteracted, so far as it is likely to materially affect prices during the ensuing summer. With regard to gas coal contracts, a number of inquiries are already upon the market; but, so far, nothing of any great importance has been actually settled which could be taken as a reliable indication as to the probable course of rates. Generally the tenders which are being sent out are based upon pretty much the same figures as those obtained last year; and, roughly speaking, they may be said to range from 9s. to 10s. per ton, according to quality, for ordinary screened gas coal at the pit's mouth. So far as there are any indications as to the course of prices, the tendency, however, would seem to be in the direction of some slight giving way upon last year's quotations; but this certainly is not likely to exceed 3d. or 6d. per ton at the outside. As one or two important contracts will, in all probability, very soon be settled, these will afford some more accurate basis of the actual prices which are likely to be taken for next season's supplies; and these we shall record as opportunity offers, in order to keep our readers well posted with the course of the market as regards various descriptions of gas coal throughout Lancashire.

MANCHESTER CORPORATION GAS SUPPLY.

The Price of Gas—The Gas Committee and Electric Lighting.

At the Meeting of the Manchester City Council last Wednesday—the MAYOR (Mr. Alderman Mark) presiding—two resolutions referring to the price charged for gas were before the members.

Mr. SMALLMAN first moved—"That it be an instruction to the Gas Committee to consider and report upon the desirability or otherwise of supplying gas used solely for manufacturing purposes per special meter and at a lower price than is now charged for same." This question, he said, was closely connected with that of pure air. There were two causes of air pollution—one the smoke from the manufactories, the other the smoke from domestic fires. The latter was the chief cause of evil. Those of them who lived outside the town found the air clear when they left in the morning; but when they came to the residential part of Manchester, they found a pall. In the middle of the city, the atmosphere was moderately clear. This would seem to indicate that it was the domestic fires which were the cause of mischief. In regard to the smoke nuisance, he thought that the Corporation were themselves great sinners.

Mr. SOUTHERN seconded the resolution.

Alderman Sir J. J. HARWOOD said the Gas Committee were preparing a report, which would shortly be laid before the Council; and he hoped in the meantime the Council would suspend judgment. As to the reports about the Manchester atmosphere, he simply did not believe them. It was no true test to analyze the rain-water which fell at the end of many weeks of dry weather, when impurities had collected. In fact, they had had no reliable data on this subject up to the present. He maintained that, if the price of gas were reduced to 1s. 6d. per,1000 cubic feet, it would not in any way compete with coal at the prices of to-day.

Dr. SIMPSON commented on Sir John Harwood's disregard of scientific tests. At the same time he would not defend some of the analyses of the Manchester atmosphere which had been published.

The resolution was adopted.

Dr. SIMPSON then moved—"That having regard to the urgent need, in the interest of the community, of reducing the present pollution of the air, it be an instruction to the Gas Committee to consider and report to this Council at the earliest opportunity as to the practicability of making such a substantial reduction in the price of gas supplied within the municipal boundaries as will encourage its use for power, for heating, and for cooking purposes." In support of the motion, he said he did not believe the air of Manchester was of the purity which Sir John Harwood would make out. They knew that domestic smoke was accountable for a great part of the fogs of Manchester; and that this was proved by scientific men. The price of gas had been reduced, but not to a point at which it could be economically used in place of coal. If it were further lowered, they would find an enormous increase in the use of gas-engines; and if it were so reduced that it could be burned in the cottages of the poor, the advantage would be marvellous. He did not wish to force the hand of the Gas Committee, nor to fix the price of gas; but it was an extraordinary thing that private companies could supply cheaper gas than the Corporation.

Alderman SHAW: Give the illuminating power.

Dr. SIMPSON said the Manchester gas was supposed to be of 20-candle power; but he knew that it was only 16 candles.

Sir J. J. HARWOOD said the Committee were not in the habit of making false records. It was a serious matter for Dr. Simpson to insinuate that their statements were not reliable.

Dr. SIMPSON said his authority was an eminent consulting chemist of the neighbourhood.

Sir J. J. HARWOOD said the Public Analyst had made careful tests; and the results completely bore out the Committee's reports.

Dr. SIMPSON said he should still maintain that other places supplied cheaper gas; and he thought that in Manchester they ought to have purer gas than was the case now. He understood that in London the maximum amount of sulphur in the gas was about 20 grains per 100 cubic feet; but he had been told that in Manchester the amount was sometimes as much as 40 grains per 100 feet. He urged that an honest endeavour should be made to remove these causes of reproach, and remarked that good water and healthy dwellings, though very valuable in themselves, were of small account when the air people breathed was not fit for them to respire. He hoped these matters would be dealt with by the Gas Committee with an honest intention and endeavour to reduce the frightful pollution of the air from which the people of the city suffered; and one of the great means for bringing about such a reduction of pollution would be by the extensive use of gas.

Alderman Dr. RUSSELL, in seconding the motion, said the allegation of the general public against the Gas Committee was that, while the Sanitary Committee and the Parks Committee were doing great and good work for the people, the Gas Committee were doing nothing at all. Their policy was one of delay; and they always seemed desirous of putting things off to some other day. The general principle of the reduction in the price of gas he took to be a foregone conclusion. The price would have to be reduced, and what they desired was that the most procrastinating of Committees should tell them when, or give them a distinct assurance of any actual date when, they would report upon this question.

Sir J. J. HARWOOD said it was not a correct representation of the policy of the Gas Committee to say that they were standing still and doing nothing. He believed that he had given more years to studying the welfare of the city and promoting the health of the citizens, than the seconder of the resolution had given days. Why did not these gentlemen who were lecturing the Gas Committee on the method in which they did the work, come into the Council and see the difficulties? Nothing was easier than to stand aside and lecture those who were doing the work. That was the position of some men who neither knew nor looked at the difficulties. They were formerly told that gas

was destroying books and pictures, and injuring the health of the people. They thereupon gave Sir Henry Roscoe an order to spend what he liked in making an investigation into the matter; and in his report he stated that while he could not say there was no impurity, nor that the gas did not injure books, he could say that nobody could prove that the Manchester gas either injured books, pictures, tapestry, or anything else in the house. All he (Sir John) asked the Council to do was to suspend judgment until they had the report of the Gas Committee before them; and they would try to do the best they could.

Alderman KING pointed out that Dr. Simpson's resolution would mean a reduction in the price of all gas consumed; and he suggested that what Dr. Simpson wanted would be obtained if the words "as will encourage its use" were struck out. The price of gas for other purposes would not then be affected by the resolution.

Dr. SIMPSON accepted the suggestion; and the resolution as amended was adopted.

The minutes presented by the Gas Committee contained the following resolution—"That if, as recommended by the Town Hall Committee, it is determined by the City Council to take immediate steps for the supply of the electric light to the Town Hall, this Committee would remind the Council that to them has been deputed the carrying out of the Provisional Order obtained from Parliament for the supply of electricity within a certain area of the city; and they recommend, as a measure of economy and for other important reasons, that the instruction to at once proceed with the above installation be left in the hands of the Gas Committee."

Sir JOHN HARWOOD said that in making arrangements for the installation in the Town Hall, it would be necessary to bear in mind the larger measures which the Gas Committee were empowered to carry out, so that there would be no waste of public money.

A resolution was subsequently passed, authorizing the lighting of the Town Hall by electricity, under the auspices of the Gas Committee.

A DISPUTE AT THE COVENTRY CORPORATION GAS-WORKS.

The Coventry Corporation Gas Committee and the men employed at the gas-works are not just now on the most friendly terms. It is stated by the latter that about six weeks ago the Manager (Mr. G. Winstanley) introduced a new system of working, which it was contended would tell against them. They formulated a scale of wages, which they believed was fair and reasonable, and embodied it in a memorial to the Chairman and members of the Gas Committee. Their memorial ran: "We, the carbonizers, coke-wheelers, coal-wheelers, engine-drivers, and yardmen employed at the City Gas-Works, feel that we are very much overworked and underpaid; and we therefore ask that the following shall be the terms of our employment in the future." Then followed the prices asked for various kinds of work; and the memorial continued: "As we feel that the foregoing are just and reasonable requests, and such as are granted to Birmingham and other towns, we trust you will see your way to granting them. We feel it unnecessary to remind you of the exhaustive nature of our employment, or to describe in detail all the trying circumstances surrounding the process of gas-making, especially during the warmer period of the year; and we feel that in thus appealing to you, we shall receive at your hands that thoughtful and kindly consideration which has ever been characteristic of your public life." The gas-works employees complain that this memorial was ignored by the Gas Committee; and that instead a notice, addressed to them, was posted on the works on the 1st inst., as follows: "As an inducement to steady and permanent service, the Corporation is prepared to place to the credit of every stoker and yardman who signs an agreement in the form given below for a period of not less than twelve months, a bonus of one shilling per week in addition to his wages. This bonus, amounting to £2 12s. for one year's service, becomes the absolute property of the workmen at the end of the period for which he has signed. In addition to the bonus, the men have the advantage of certain employment, as the Corporation is bound by the agreement not to dismiss any man who signs it, provided he is sober, honest, industrious, and able to do the work allotted to him until the agreed period is at an end. All those who accept this offer are requested to give their names in to the Sub-Manager or to the undersigned by ten a.m. on Saturday, May 2." The men state that not sufficient time was given them to consider the terms of the agreement, or of thoroughly grasping its contents. This was followed up by the importation of some men—nearly thirty—from Banbury; and beds had been fitted up for them in the works. The Banbury men state that they signed contracts of service for twelve months, and were told that there was no dispute. They commenced work on Monday morning; but on learning the position of affairs, and the state of disaffection among the men, they left, alleging that they would not be parties to taking the bread out of the mouths of their fellow-workmen. The Union men among the Coventry gas workers paid the Banbury men's fares back, and most of them returned home the same evening. The Coventry men were aggrieved because their memorial to the Gas Committee had not been considered; and some of them alleged that they did not believe the memorial had ever been laid before the Committee. The Chairman of the Corporation Committee states that the ordering of the beds was in no way connected with the engagement of the Banbury men. The men had been in a ferment for some months past; and the Committee knew two months ago that the present dispute was likely to arise. The beds were ordered simply as a precautionary measure. The Committee were much too near a strike eighteen months ago to expose the city to the same risk again; and finding a great deal of agitation among the men, and that threats were being used, the beds were ordered for use in case of emergency at the recommendation of the Gas Manager (Mr. G. Winstanley), and with the sanction of the Chairman and Vice-Chairman of the Gas Committee. The Chairman also states that only a very few of the men are dissatisfied. He and the Vice-Chairman interviewed sixteen of them at the works on Monday; and they all declared themselves perfectly satisfied both with their wages and their work. The agitation is simply one that is fomented from Birmingham. The memorial received by the Chairman was enclosed in an envelope bearing the title Amalgamated Society of Gas Workers, Shakespeare Road, Birmingham. The work is going on as usual; and the Banbury men were sent for not to displace others, but because more strong labourers were required. The Gas Committee met last Thursday morning to consider the memorial sent to them by the men; and it is hoped that the dispute will soon be amicably settled. The Committee expressed their willingness to meet a deputation from the workmen in compliance with the request contained in the memorial.

RECENT GAS EXHIBITIONS.

During four days of the past week a highly successful exhibition of gas cooking, lighting, and warming apparatus has been held by the Lea Bridge District Gas Company at the Victoria Hall, Walthamstow; courses of very interesting lectures on cooking by gas being delivered twice daily to large audiences by Miss Kelman. Messrs. T. Fletcher and Co. exhibited a number of their well-known gas cooking-ranges, stoves, fires, &c.; and Messrs. W. Sugg and Co., Limited, brilliantly illuminated the large hall with their high-power lights. This Company also had on show a number of lamps suitable for domestic lighting, as well as some of their high-power public lamps, two of which illuminated the street outside the hall. Messrs. A. Wright and Co. had a very interesting exhibit of different kinds of gas apparatus; they also provided one of their large improved test-meters for measuring the quantity of gas used at each lecture. Messrs. W. Parkinson and Co exhibited model station meters, governors, experimental meters, &c., Messrs. Thomas Glover and Co. showed two experimental meters; and Messrs. Burt, Boulton, and Co. displayed a large number of tar and ammoniacal products—the whole forming a highly interesting and efficient exhibition. All the arrangements were ably carried out by Mr. W. Thorman, the Company's Manager.

A very successful exhibition of gas cooking and other appliances was held at Colne last week, under the joint management of the Gas Committee of the Local Board; Mr. H. Simmonds, the Engineer and Manager; and Mr. E. W. T. Richmond, Managing Director of Messrs. Unsworth and Richmond, of Warrington. This rising firm, it may be remembered, made a good show at Exeter; and they have also been exhibiting at Newcastle-under-Lyme. The exhibition at Colne, which was opened by the Chairman of the Gas Committee (Mr. S. Catlow), was very tastefully laid out, and consisted of a large display of the firm's model ranges (fitted with their new improved removeable burners), gas-fires, tubular heating-stoves, grillers working with prepayment meters, boiling-burners, gas-irons, &c. A large stand was fitted up with Braithwaite's patent thermodote, showing how the hot-water difficulty in any house or hotel can be at once overcome. This ingenious contrivance is covered by three patents, which are leased to Messrs. Unsworth and Richmond, Limited. Messrs. Stott showed their governor and the Stott-Thorpe lights. The Gas Committee's own stand contained aniline dyes, glass-faced meters, &c. Mr. Howarth, of Burnley, showed gas washing-machines; and Messrs. Webb and Son, of Leicester, had a fine display of their varied patterns of street and shop lamps which are being largely patronized. Messrs. Wilson and Son, of Leeds, exhibited gas-fires only. The Wenham Company had a very attractive stand, fitted up in an elaborate manner; and it displayed to advantage some beautiful designs they are now supplying. Cookery lectures were delivered in an adjoining room (lighted by Siemens lamps) by Mrs. and Miss Thwaites, and were well attended. In addition to the mere display of the goods above mentioned, Messrs. Unsworth and Richmond provided on Thursday night a 1s. gas-cooked supper, which was a great success, and aroused much local enthusiasm; about 120 persons partaking of it. To celebrate the success which had attended the exhibition, Mr. Richmond invited the Gas Committee and Mr. Simmonds, together with a number of gas engineers from neighbouring towns, to dine at the Crown Hotel, Colne, on the Friday evening. The proceedings were of the most hearty character. The toast, "Success to Messrs. Unsworth and Richmond, Limited," was proposed by the Chairman of the Local Board, and responded to by Mr. Richmond in a speech which subsequently gave rise to considerable discussion on the question of supplying gas at cost price. The success of the exhibition may be judged from the fact that up to Saturday morning upwards of 70 cookers had been signed for.

THE DUBLIN CORPORATION AND THEIR GAS INSPECTOR.

An Advance of Salary.

In the course of our remarks last week on the recent legal proceedings between the Dublin Corporation and the Gas Company in regard to the non-supply of gas to a certain public lamp (*ante*, p. 799), we remarked that the stroke of genius displayed by the Gas Inspector in bringing about the proceedings in question ought to be recognized by an increase of salary. By a curious coincidence, just at the time these remarks were being put in type, the Dublin Corporation were discussing the advisability of taking the course suggested. The matter was introduced by Alderman Perry, who moved—"That Mr. T. J. Cotton, Inspector of Public Lighting, be re-elected; and, further, that the recommendation of the Special Gas Committee recommending the addition of £100 a year to Mr. Cotton's salary be adopted." He said Mr. Cotton's action in the last three years was such as to strengthen the hands of the Special Committee in dealing with the Gas Company; and he was sure the Council would reward him for his labours. He thought it would not be denied that during Mr. Cotton's three years of office the illuminating power of the gas in the city had been very much improved; and this was owing to the knowledge—the scientific knowledge—of Mr. Cotton. He therefore moved that Mr. Cotton's salary for the ensuing year be £500. Alderman O'Toole seconded the motion, and said that Mr. Cotton was a most painstaking officer of the Corporation. Mr. O'Meara remarked that the result of the election

of Mr. Cotton was a saving of £3500 in the gas accounts of the Corporation for three years, without any diminution in the illuminating power of the gas. The High Sheriff (Mr. J. Shankes) remarked that so far from there being a saving of £3500 in three years, it did not amount to more than £200 a year; and even this was being dissipated by subsequent returns. Whatever saving was effected was owing to the discount given by the Company, which the Corporation might have obtained since 1882, and the reduction in the hours of lighting, which made Dublin a bye-word as being the worst-lighted city in the world. Mr. Mayne pointed out that before Mr. Cotton became Inspector the cost of lighting in the city was gradually increasing; but since then it had been reduced. He denied that the hours of lighting had been altered in the city in Mr. Cotton's time, as they were now what they always had been. Mr. Smyth moved, as an amendment, that Mr. Cotton be re-elected at his old salary—£400 a year. He said Mr. Cotton had estimated the price of the gas plant at £3000, and the Gas Company were awarded compensation to the extent of £14,000 or £15,000. He thought a person who made so erroneous an estimate was not entitled to an increase of salary. Mr. Sexton seconded the amendment, as he thought no sufficient ground had been made out for the advance. After some further discussion, the amendment was put and lost; whereupon the motion was submitted, and carried by a large majority.

WIGAN CORPORATION GAS SUPPLY.

The Gas Engineer's Annual Report.

In the JOURNAL last week brief reference was made to the report lately presented by the Gas Engineer of the Wigan Corporation (Mr. Jos. Timmins) on the working of the gas undertaking during the year ending March 31. We give now a few additional particulars from the document, and also from the abstract of accounts accompanying it.

Beginning with the manufacturing department, the quantity of coal and cannel carbonized last year was 23,407 tons 11 cwt., as compared with 21,671 tons 11 cwt. in the previous year; being an increase of 1736 tons. The gas made was 264,529,000 cubic feet, against 245,054,000 cubic feet—an increase of 19,475,000 cubic feet, or equal to 7·947 per cent. The quantity sold was 249,749,700 cubic feet, against 230,973,000 cubic feet—an increase of 18,776,700 cubic feet, or equal to 8·129 per cent. This large augmentation in the consumption is highly satisfactory; the figures for the three preceding years being 1·115, 1·855, and 4·926 per cent. respectively. The quantity of gas sold for cooking, heating, and motive power was 12,219,300 cubic feet. The average illuminating power of the gas supplied was 18·70 sperm candles. The quantity of coke made for sale, per ton of coal and cannel carbonized, was about the same as before; but rather less was used in manufacture. The quantity of sulphate of ammonia made was below that of the preceding year. This is accounted for by the fact that more than half of the coal was supplied under new contracts, and was of a kind which did not yield the same quantity of ammonia as the coal carbonized under previous contracts. The tar made was in excess of that of the preceding year. With regard to distribution, broken and otherwise defective mains (the result of subsidence caused by mining operations and the very severe weather of the past winter), were repaired to the number of 282; but the dislocation of mains from the abovementioned cause was not nearly so bad in the past twelve months as in previous years. The leakage was 4·86 per cent., showing a steady decline from 1888, when it was 7·75 per cent.

Turning to the financial part of the report, the manufacture of gas cost £17,208 16s. 1d. last year, as compared with £13,681 18s. 9d. in 1889-90. But coal cost £12,603, against £9944, or 1s. 7d. per ton more (equal to £1646), owing to enhanced prices under new contracts. Then wages were much higher (equal to 3d. per ton of coal carbonized), in consequence of recent labour movements; and the cost of purification was also higher, owing to depreciation in the value of spent oxide. Distribution came to £1187 13s., as against £1014 2s. The total expenditure was £28,635 19s. 5d., against £23,966 8s. 11d. As the receipts were £51,932 18s. 6d. last year, and £47,171 19s. 6d. in 1889-90, there was a gross profit of £23,296 19s. 1d., as compared with £23,205 10s. 7d.; the net profit being £11,111 5s. 3d., as against £10,646 8s. 8d. The cost of manufacturing gas was 14s. 8·443d. per ton of coal carbonized and 16·536d. per 1000 cubic feet of gas sold, against 12s. 7·519d. and 14·215d. in 1889-90. There was paid last year for interest and sinking fund £12,122, or 10s. 4·292d. per ton of coal carbonized, as compared with £12,357, or 11s. 4·851d. per ton in the preceding twelve months. The capital invested in the undertaking at the close of the past financial year was £270,937 17s. 8d.; being equal to £11 11s. 6d. per ton of coal carbonized, and £1 1s. 8¼d. per 1000 cubic feet of gas sold. At the corresponding period last year the figures were £12 7s. 3d. and £1 3s. 2¼d.

EXTENSIONS AT THE WEST BROMWICH GAS-WORKS.

At the Meeting of the West Bromwich Town Council last Wednesday, some important proposals were made with reference to the extension and improvement of the gas-works of the Corporation. In the first place, the Gas Committee reported that the quantity of gas sold during the financial year ending March 31 last, was 201,319,700 cubic feet; being an increase of nearly 6½ per cent. over the previous twelve months. The revenue from the sales, including the public lighting of the borough, was £25,550—an increase of £1149. They further reported having considered the question of extending the works and manufacturing plant to meet the growing demand for gas; and they instructed the Manager (Mr. Littlewood) to report upon the additions necessary to be made and the cost thereof. After considering his report, they called in Mr. T. Newbigging, M. Inst. C.E., of Manchester, to advise them in regard to the matter; and his report to a large extent confirmed the recommendations made by their Manager. The Committee had therefore resolved to recommend the Council to apply to the Local Government Board for sanction to borrow £33,310 for the following purposes: New retort-house and retorts £14,500; gasholder and tank, £11,500; four purifiers, with the necessary valves and connections, £1050; sulphate of ammonia plant, £1000—washer-scrubber, condensers, boiler, and other appliances, with land, making up the abovenamed total. The Committee explained that they did not propose to carry out the entire scheme at one time, but to proceed with the work as might be found necessary. It was proposed to erect the scrubber at once; and they had therefore obtained tenders for it, and recommended the Council to approve their action in accepting the tender of Messrs. Kirkham, Hulett, and Chandler, Limited, for the supplying and fixing one of their patent "Standard" washer-scrubbers, of the capacity of a million cubic feet per day, at the price of £470, exclusive of valves and connections. Alderman R. Farley, in moving the adoption of the report, explained to the Council that the extensions contemplated could be made at the works without involving any additional burden upon the borough, or the diminution of the profits. The increase in the demand for gas during the past year was 6½ per cent.; and during the last 10¾ years, since the undertaking was transferred from the Birmingham Corporation, the consumption in the borough had increased upwards of 40 per cent. The Committee were now anxious to avail themselves of the most improved appliances for the manufacture and purification of gas. At the present time there was an absolute necessity that the storeage room at the works should be enlarged. During the past winter they had carried on the business under some amount of peril; and the Committee were desirous of removing this danger. It would be a great calamity if the town should, through deficiency of storeage accommodation, be plunged into darkness. He also explained that the improved apparatus would effect a great saving. The report was unanimously adopted.

ROCHDALE CORPORATION GAS AND WATER SUPPLY.

The Annual Accounts.

The Borough Treasurer of Rochdale (Mr. Elliott) has issued his accounts for the year ended March 25 last. From those showing the position of affairs in the Gas Department, it is seen that the profits have decreased by £4535 as compared with the previous year—from £13,575 to £9040. Coal, however, cost £6700 more; and the stokers' wages advanced by £1035, so that really there has been a gratifying expansion in business. The gas-rental stands at £41,892, as against £39,532; and the income from residual products has risen from £16,063 to £17,619. Almost the whole of the increased income from residuals is, however, due to the augmented receipts from the sale of coke. During the year there has been an expenditure of £11,305 on new apparatus. The sum of £4605 is put down as having been spent on Brin's oxygen plant. Then £3928 has been laid out on the installation of inclined retorts; £1302 has been expended on a new washer and scrubber; £798 on a telescopic gasholder; and £670 on the governor house and offices. As to the accounts of the Water Department, they are very satisfactory, inasmuch as they show no cessation in the decreased deficiencies which have been the rule for several years. Three years ago the deficiency was £12,732; two years since it was £10,200; and in the past twelve months it has fallen to £9319. Two causes are operating in this direction. There has been a gradual reduction in the amount of interest payable on the water-works debt owing to the cheapening of money; and, on the other hand, the revenue from water supplies has been growing. The ordinary water-rental has increased on the year from £21,886 to £22,295; and that from meter supplies from £4220 to £4672. The receipts from special services for mill lodges and for building purposes show a diminution of about £170, no doubt owing to the wet summer of last year, but the total revenue is £27,593, as compared with £27,080 the year before.

BLACKPOOL CORPORATION GAS SUPPLY.

Reduction in the Charge for the Public Lamps—Abolition of Meter-Rents.

The Blackpool Town Council were occupied, at their meeting last Tuesday, in considering various matters connected with the gas undertaking. The minutes presented by the Gas Committee contained resolutions that the tenders of Messrs. Foster Bros. and Messrs. R. and J. Dempster for ironwork in connection with the furnaces in the retort-house now in course of completion at the gas-works (to which reference has already been made) should be accepted; that a sum of £300 should be taken from the renewal fund, and applied towards the cost of the new retort-house; that the price charged for the street lamps should be reduced from 45s. to 41s. 8d. per annum for each single-burner lamp in use for 2000 hours; and that all meter-rents should be abolished as from the date of the confirmation of the resolution by the Council. In the course of the remarks to which the presentation of the minutes gave rise, the Chairman of the Committee (Mr. Parkinson) referred to their work during the past financial year. He said they entered upon it with somewhat unpleasant feelings, as they had an increase in the price of coal as well as an advance in wages and in the capital account. This, with the re-arrangement of the works, made them afraid that they would not have so much profit as in the previous year; but they were happy to say they were in a better position. They had taken more than usual care, in the details of working, to prevent any undue waste; so that the concern might show as good results as possible, combined with a due regard to the efficiency of the plant and a good supply of gas at the standard required by the Corporation. This had been done, thanks to the Committee, the Manager, and the workpeople having worked so well together. They had an increase of about 200 consumers, and an increase of about 20 million cubic feet of gas consumed. They estimated they would have to make 127 million feet of gas; they had actually sold 146 millions. Last year the net profits were £4327; this year (with increased expenses) they were about £4552. The Committee considered this rather a large sum, but not so large as to warrant them in reducing the price of gas; for, in their opinion, 1d. per 1000 cubic feet would be too small a reduction, and they could not recommend the Council to reduce it 2d., as it would be too much, and take £1320 out of the

profits. Therefore, they thought, by doing away with the rent of meters, they would meet the popular ideas, though some held the opinion that this was not the correct method of reduction. Still it would give relief to the greatest number of consumers, and assist to create customers amongst the working people. This would mean a loss of about £730 per annum; and the further reduction in the cost of the street lamps with single burners from 45s. to 41s. 8d., meant £220 per annum. This was as far as the Committee felt they could go, having in view that they had not yet made their contracts for coal for the ensuing year, which would probably be at an increased cost. They would also have to provide interest and sinking fund for upwards of £19,000 more capital, which would go in the new retort-house, machinery, and new street mains. If the Council thought proper, they could have the £220 taken off the street lighting as at present, and spend it in providing more light in the back streets. Altogether the Corporation could look upon the past year as a prosperous one; and he quite hoped the next would be as successful. The minutes were passed.

BOLTON CORPORATION GAS SUPPLY.

A Year's Progress and the Disposal of the Profits.

At the Meeting of the Bolton Town Council last Wednesday, the annual report and abstract of accounts relating to the Gas Department were brought forward for approval.

Alderman MILES, in moving the adoption of the report, said the capital expenditure stood at the same figure as last year—viz., £510,461 18s.—which, upon an increased make and sale of gas, placed the item at the comparatively low figure of £705 9s. 1d. per million cubic feet of gas made, £6 18s. 10d. per ton of coal carbonized, or 14s. 8d. per 1000 cubic feet of gas sold. The Gas Committee were, he added, anxious to reduce the capital account, and were making every effort to do so; but at the same time he must inform the Council that the carbonizing power of the works was taxed to its utmost limit. In fact, the Committee were taking steps to increase the make by the erection of two more benches, comprising 300 retorts, on the regenerative system. This extension it was expected would supply power to produce 50 million cubic feet more gas at the Lum Street works; and, if successful, it could be increased to 100 millions at a very small expenditure of capital. On revenue account they had received for gas during the past financial year £94,279 19s. 11d., against £83,504 14s. 1d. in the previous twelve months—an increase of £10,775 5s. 10d., or equal to 13 per cent. A portion of this was due to the 2d. per 1000 cubic feet advance in price, which was in operation some three months only of last year; and the rest to the fact that they had sold 51,926,000 cubic feet more gas than in the previous twelve months. Coke had produced £13,996 14s. 3d., against £10,008 10s. 10d.; tar, £7289 6s. 10d., against £6844 10s. 6d.; but sulphate of ammonia realized £31 15s. 3d. less than before. This was explained by the fact that the average market price obtainable was lower by 17s. per ton than in the previous twelve months. For hired meters they had received £365 4s. 7d. more, which was a gratifying feature. Coal and cannel had cost £10,042 13s. 3d. more—the Committee having had to pay an increase of 2s. 3¾d. per ton; and stokers wages were £788 16s. 6d. higher than in 1889-90. The bad debts amounted to only £90 9s. 1d., on a turnover of £126,432 13s. 8d.; bearing witness to the diligence and efficiency of the office staff. The gross profits amounted to £53,756 6s. 8d.—an increase over the previous year of £1111, 6s. 3d.; thus beating the record. In the disposal of this large sum, there were the usual allowances for sinking fund, dividend on the Corporation stock, the standing charges for annuities, 2¾ per cent. on the value of the permanent works, and a special further apportionment to this fund of £7892 14s.; leaving £15,000. This the Committee proposed should be applied in relief of the rates; being equal to 11d. in the pound. As to the prospects of the current year, he thought, on the whole, they were favourable; but, of course, a great deal depended upon what they would have to pay for coal and cannel. Their contracts had not yet been renewed; and it was expected there would be a saving in this direction. He did not consider they had reached the acme of perfection at the gas-works; but he believed they would, during the coming year, improve in several particulars. He concluded by paying a compliment to the whole of the officials in the Gas Department.

Mr. HOLDEN criticized the accounts, and held that the consumers were entitled, on the face of the results, to a reduction in price.

Alderman BARRETT, the ex-Mayor, moved an amendment to the effect that the Gas Committee reconsider their estimates.

After some discussion, this was accepted by the Chairman, and adopted; the idea being that the Committee should increase the grant in aid of the rates.

Reduction in the Price of Gas at Hull.—The Directors of the British Gaslight Company, Limited, have reduced the price of gas at Hull to 1s. 9d. per 1000 cubic feet; the reduction to take effect as from the 1st ult.

The Portsmouth Corporation and the Water-Works.—The Special Committee appointed by the Portsmouth Town Council to inquire into the practicability of acquiring the water-works have so far made little headway. Inquiries have been made in regard to the proprietorship of water-works in other towns throughout the country, and about 100 replies have been received. From the particulars thus given, it appears that the Middlesbrough Corporation is the only local authority who have acquired the water-works by compulsory powers; and the reason given was that the resources of the existing Company were not proportionate to the growing requirements of the town and district. The Committee say that in many cases where corporations have taken over water-works by arrangement, the terms have been arrived at only after pressure was brought to bear. So far as the Portsmouth Water Company are concerned, the Directors have intimated to the Committee that, seeing they are enabled to give a constant supply at high pressure, they fail to recognize that any necessity exists for altering the present control of the system. The Committee have appointed five of their number as a Sub-Committee to make further inquiries.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

The Half-Yearly General Meeting of the Proprietors in this Association was held last Tuesday, at the Cannon Street Hotel—Sir JULIAN GOLDSMID, Bart., M.P., presiding.

The SECRETARY (Mr. R. S. Gardiner) read the notice convening the meeting, and also the following report of the Directors:—

The present half-yearly ordinary general meeting of the proprietors has been convened in conformity with the Association's Acts of Parliament, for the purpose of receiving a report from the Directors upon the affairs of the Company, and of declaring a dividend for the half year ended the 31st of December last.

The following summary shows the results of the Association's operations during that period:—

The quantity of gas made in the half year ended the 31st of December last was 4163 million cubic feet; and the quantity made in the corresponding half year of 1889 was 4066 million cubic feet—being an increase of 97 millions, or at the rate of 2·38 per cent.

The total number of lights on the 31st of December last amounted to 1,901,253; there being at that date 138,188 consumers on the books of the Association. At the close of the corresponding half year of 1889 the number of lights was 1,837,001, which gives an increase of 64,252, or at the rate of 3·5 per cent.

The entire length of mains laid on the 31st of December last was 1546 miles; and on the 31st of December, 1889, 1513 miles—an increase of 33 miles.

The increase in business indicated by these figures was accompanied by a moderate increase in the gas-rental; but, owing to the considerable advance in the price of coal, the profit earned during the half year under review shows a decrease on the two previous half years. Coke and tar yielded an increased revenue; but there was a decrease in the value of ammoniacal liquor.

The plant and mains at all the stations were maintained in a due state of efficiency.

The enlargement of the Schöneberg works at Berlin was practically completed; and the erection of a new gasholder on the Association's Tabor works at Vienna was further proceeded with.

The Directors have to report that they have obtained a prolongation of the concession for the lighting of Steglitz, a small suburban commune of Berlin, until the year 1921; and a concession for the lighting of Speising, a small suburban commune of Vienna.

The Directors have found it desirable to add to their property at Amsterdam, Berlin, and Frankfort; whilst they have sold land for which they had no further use at Berlin, Ghent, Lille, Marseilles, and Rotterdam.

The offices in Clement's Lane are now far too small for the accommodation of the different departments of the London work. The Directors have therefore purchased the site of No. 21, Austin Friars, E.C., upon which a new head office is in course of erection.

The Directors have elected the Hon. Edward Chandos Leigh, Q.C., a Director of the Association, to fill the vacancy on the Board created by the lamented death of Mr. Henry Wood.

The Directors desire, in conclusion, to draw the attention of the proprietors to the accounts for the half year ended the 31st of December last. These have been duly audited, and from them the Directors have, in accordance with the provisions of the Companies' Clauses Consolidation Act, prepared a scheme showing the profit of the Association for the half year, and the portion thereof applicable to the purposes of dividend which they recommend now to be declared—viz., a dividend of 5 per cent. and a bonus of 1 per cent. for the half year ended the 31st of December last, both payable, free of income-tax, on and after the 1st day of June next.

The Directors who go out of office by rotation are Thomas Henry Goodwin Newton, Esq., Colonel J. Wilkinson, and Arthur Lucas, Esq., C.E. These gentlemen are eligible for re-election, and offer themselves accordingly.

The Auditor who goes out of office by rotation is Joseph Sebag Montefiore, Esq., who is eligible for re-election, and offers himself accordingly.

The CHAIRMAN observed that the shareholders would have noticed that the report did not contain anything remarkably new—a circumstance indicating the even and regular course of the business of the Association; and it showed that there had been a moderate and reasonable increase of business at their different stations on the Continent. The question which principally interested most gas companies was the cost of coal; and they were all aware that last year there was a very considerable rise in that necessity of a gas company, with the result that there had been a somewhat diminished profit. The Directors had anticipated this, and had made all their arrangements carefully; and, on the whole, he thought the results of the half-year's working were remarkably satisfactory—all the more so as they were able to propose the same dividend as on the previous occasion. In some respects, of course, the increased price of coal was compensated for by the extra price at which they were able to sell their coke; but the two things did not always absolutely correspond, because as a matter of fact, contracts were very frequently made some time beforehand, which had to run their course, and could not be altered at a moment's notice. On the whole, however, a certain amount was recouped by the higher price of coke; and he must say that, as he had thought would be the case last year, the increase in the price of coal to which he had referred had not been permanent. They had only very recently been making their contracts for next year; and he was glad to tell the shareholders that they had obtained a very considerable reduction in the price. At the same time, he thought it was only right to inform them that the evil results of the high prices had only affected the last three months of the half year under review, and that they would influence the whole of the half year with which they would have to deal at their next meeting; and consequently the returns for the next six months might be less satisfactory than those which were now under consideration. This, as he had said, would only be a temporary evil in consequence of the high prices which had prevailed; and succeeding half years he hoped would not be affected by it. He had mentioned on previous occasions that the Directors always endeavoured, as far as possible, to give light to the suburbs of the great towns which they supplied with gas; and in continuation of that policy, as any new suburb grew up in the neighbourhood of Berlin or of Vienna, if possible they arranged a new contract. In consequence of this practice, they had referred in the report to two or three small contracts which they had just made. On the whole, their business had been extremely uneventful during the past half year; and when it was uneventful the proprietors might be satisfied that it was in good and proper condition. At the meetings of the proprietors he generally referred to any events

which had occurred since the close of the half year, and to anything which affected the gas industry; and at their last meeting, he told them that, in his opinion, the future of the gas industry was very much bound up with the use of inclined retorts. Since then he had been trying to obtain some further information on the subject; and he found that their friends The Gaslight and Coke Company were using the system very largely, and were reaping considerable profit from it. It was a system by which the retort really supplied itself, instead of being supplied by human power; and he thought that their Engineers, like the engineers of other gas companies, would have in the future to direct their attention principally to this department for the development of the business. He did not say that any particular system—the Coze or any other—was the right one, or that anyone had arrived at a satisfactory conclusion as to which was the best. But there were several that were good; and he commended the subject to their staff, and to all who were interested in the prosperity of the Association. Another point to which he would refer would be very interesting to them, though it did not immediately affect the shareholders, except in the case of his (the Chairman's) absence. They would remember that just before their last meeting they lost their late Deputy-Chairman, Mr. Wood, who had served the Association so well for so many years. In that gentleman's place, they had elected Mr. Chandos Leigh, who was an able Director; but the Board had also to appoint a Deputy-Chairman to succeed Mr. Wood, and their choice had fallen upon the oldest Director (Mr. T. H. G. Newton), whom they all well knew, and who possessed the confidence of the Board as he did of the shareholders. Then within the last two months they had had a very severe loss owing to the removal by death of their second Engineer—Mr. Richter—at Berlin, who was one of the best servants of the Company. The deceased gentleman had been a member of the Berlin Town Council, and was respected and known by the Magistrates at Berlin, and by most of the inhabitants of that city; and not only did he serve the Association faithfully, but he was regarded as a model man in his different public capacities. The Directors deeply regretted the loss which the Association had thus sustained. Since the date of the report, they had made arrangements for selling a small station, the contract for which had expired, and out of which, in future, he did not believe any great profit was to be made. It was a small station called Stolberg. They had also had to consider the question of finance since the date of the report. Questions of finance had not distressed them much of late years. They had generally found that they had money to deal with; and that if they wanted more they could get it. However, about £140,000 of their issue of debentures fell due early in August; and the question was whether they should reissue them, or what they should do. On the whole, they found that they would still require the capital for the use of the undertaking; and they offered the existing holders the right to have them renewed for seven years. This offer had been practically accepted by the whole of them, and, so far as that question was concerned, he thought it proved that the Association still enjoyed the same excellent credit which it had had for so many years. He believed that their debentures—of which there were only half a million—were as good a security as could be found in the City of London. He thought he had mentioned everything which was really of interest concerning their affairs. He was sure that their staff were doing their best to discharge their onerous duties; and they all of them kept a constant watch over everything which occurred on the Continent. As far as he himself was concerned, he might say that he received the most loyal support from all his colleagues; and the staff were always anxious as far as possible to meet their wishes. He believed that no gas company was better served than their own. He concluded by moving the adoption of the report.

Mr. NEWTON briefly expressed his pleasure at seconding the motion.

Mr. BARROW inquired whether any profit was made on the electric lighting at Vienna.

The CHAIRMAN said he believed he had often mentioned before that they undertook the electric lighting of the Opera House and the Burg Theatre at Vienna for purposes other than profit. It was not necessary to go into the question, which was a long story, and which he explained about four years ago. If they paid their way, that was all they could expect to do. He believed they were not quite paying their way; but they would shortly do so. In further replying to Mr. Farre, the Chairman stated that there was no liability on the stock of the Association. Some years ago the liability which existed was paid up out of their own resources, and not by the shareholders themselves.

The resolution was unanimously adopted.

On the motion of the CHAIRMAN, seconded by Mr. J. H. PALMER, a resolution was passed declaring a dividend of 5 per cent. and a bonus of 1 per cent. on the £3,800,000 stock of the Association, payable, free of income-tax, on and after the 1st prox.

The retiring Directors and Auditor were re-elected; and votes of thanks to the Chairman and Directors and officers were passed.

The proceedings then terminated.

The Glasgow East-End Industrial Exhibition.—Messrs. William Ramsay & Co. have been awarded the gold medal and diploma for the Siemens regenerative gas-lamps at the above exhibition; and also a diploma and medal for the excellent lighting arrangements they carried out, and the lamps they made for the exhibition.

A New Holder at the Ponder's End Gas-Works.—An interesting ceremony took place on Monday last week at the Ponder's End works of the Enfield Gas Company, when the Chairman (Colonel A. P. Somerset), in the presence of the Directors, the Engineer, contractors, and others, turned on the gas for the first time from the new holder to the town mains. This holder, which has been constructed from the designs of the Company's Consulting Engineer (Mr. Jabez Church, M. Inst. C.E., of Westminster), has two lifts, with a light wrought-iron guide-framing, braced with "Paddon" wind-ties; and it will contain, when filled, about half a million cubic feet of gas. Considerable difficulty was experienced in the construction of the tank, which is of brick and puddle, owing to the subsoil being highly charged with water. These difficulties, however, were overcome, with perfect success. The contractors for the tank were Messrs. T. Doçwra and Sons; and for the holder, Messrs. S. Cutler and Sons.

BOMBAY GAS COMPANY, LIMITED.

The Ordinary Meeting of this Company was held last Thursday, at the London Offices, 6, Drapers Gardens, Throgmorton Avenue, E.C.—Mr. R. DAVIDSON in the chair.

The SECRETARY (Mr. J. H. Perrins) read the notice convening the meeting; and it was agreed to take as read the Directors' report and the accounts for the half year ending Dec. 31 last, some particulars from which appeared in the JOURNAL for April 28 (p. 804).

The CHAIRMAN said that the balance-sheet and profit and loss account compared favourably with that of the corresponding period of 1889. The profit on the half-year's working amounted to £10,915, from which there had been taken £1500 for the reserve fund, thereby raising it to £12,869. During the half year 5511 tons of coal were carbonized, as against 5888 tons, showing a reduction of 377 tons; while they had made 1¼ million cubic feet more gas—a better yield per ton of coal having been obtained. The sale of gas per ton of coal also showed a considerable increase; and the percentage of that unaccounted for had been reduced by nearly 2 per cent. He believed the shareholders would agree with him that this was most creditable to the management, and was evidence of careful supervision in the working. With regard to the other items of expenditure, there was no important variation to which he need draw attention, except that of exchange, which, owing to more favourable rates, was £1572 better. Turning to the receipts, the gas and meter rental had returned £679 more, of which £203 was derived from public lamps, and £476 from private consumers; the quantity of gas sold to the latter being equivalent to 3½ per cent. more than for the corresponding six months of 1889. The receipts from coke and tar were £647 less; the production, of course, being smaller owing to the reduced quantity of coal consumed. It had also been necessary to reduce the price of tar, to meet competition due to the rise in exchange. The fittings business had not been quite so remunerative—the sales were not so large, and the articles disposed of were chiefly of a cheaper class, such as brackets and pendants, on which there was not so much profit as on higher priced goods. This was not altogether a disadvantage, as it indicated that the use of gas by small consumers was gradually making headway; and this they did all they could to cultivate. Their Manager had received intimation from the Municipality that they purposed increasing the number of public lamps to 3600, when, under the terms of the contract, they would be entitled to a discount of 2½ per cent. This would represent an increase of about 50 lamps above the existing number; and should they further increase the number to 3800 (which they had the option of doing), a discount of 5 per cent. would have to be allowed. It was with great regret that the Directors had to announce the death of Mr. Robert King, who evinced a strong interest in the progress of the Company, and had acted as one of the Auditors for a lengthened period. He was very well known at the meetings of the shareholders; and he felt sure the regret of the Directors would be shared by the proprietors. The Directors had appointed in his place, Mr. H. E. Jones, of the Commercial Gas Company, who was one of the best known gas engineers; and he thought they might congratulate themselves on having the services of such a gentleman. The appointment, however, rested entirely with the shareholders; and Mr. Jones would ask their confirmation of it that day. With respect to the use of the electric light for public purposes, it might be of interest to give the substance of a report made by the Municipal Commissioner to the Municipality in April last. It appeared therefrom that only three tenders were received for lighting Bombay in response to advertisements published in India, England, and America; and the Commissioners said that there seemed to be some hesitation amongst practical electricians in pronouncing that street lighting in Bombay could be carried out with success, owing to climatic conditions, and that, although it was but a doubt until it was solved, he did not advise the Corporation to sink the capital necessary to out carry the scheme before they had made further experiments. There was only one other matter to which he (the Chairman) would allude, and that was the question of the storeage of gas. Owing to the increasing make of gas which had taken place during the last few years, it would be necessary to provide for an additional holder to meet possible emergencies. Although the capacity of the Company's two holders was sufficient for present requirements, should either of them fail, they would be placed in a somewhat embarrassing position. The new holder would involve a considerable outlay, which could easily be met out of the reserve fund. The Chairman concluded by moving the adoption of the report and accounts.

Mr. W. B. M. LYSLEY seconded the motion, which was carried.

On the proposition of the CHAIRMAN, seconded by Mr. FREDERIC LANE LINGING, Mr. Charles Gandon was re-elected a Director, as was also Major C. Gordon, on the motion of the CHAIRMAN, seconded by Mr. LYSLEY.

Mr. E. A. Flinders, the retiring Auditor, was next re-elected, on the motion of Mr. G. BEARD, seconded by Mr. R. B. FITZMAURICE; and the appointment of Mr. H. E. Jones as an Auditor in place of Mr. R. King, was confirmed, on the proposition of Mr. SUART, seconded by Mr. MAGNUS OHREN.

A vote of thanks having been passed to the Chairman and Directors, The CHAIRMAN briefly responded; and then moved that a similar compliment be paid to the Manager (Mr. Louis Penny), the Secretary, and the other officers of the Company.

Mr. GANDON seconded the motion; remarking that, having some knowledge of gas manufacture, he knew how well the affairs of the Company were looked after by their officers. He had spent some years in Bombay, and so was acquainted with the difficulties which had to be encountered there. He knew that their present Manager, who had been at Bombay for something like ten years, had at all times done his very best in the Company's interests; and the way in which the consumption of gas had increased showed that he had been successful. As to their Secretary, he had been connected with the Company since its commencement; and the shareholders were all aware of the great interest he took in the concern.

The SECRETARY briefly acknowledged the vote on behalf of the officials; and the proceedings then terminated.

WEST MIDDLESEX WATER-WORKS COMPANY.

The Half-Yearly General Assembly of this Company was held last Tuesday, at the Office, Marylebone Road—Sir W. H. WYATT in the chair.

The SECRETARY (Mr. G. B. Hall) read the notice calling the meeting; and also the report of the Auditors. This stated, *inter alia*, that the revenue for the half year ended Lady-day last had been £114,751, or £2695 in excess of that of the corresponding period of 1890. The balance to credit of dividend and interest account was £147,591.

The CHAIRMAN, in moving the adoption of the Directors' report (which was taken as read), stated that the period under review had been a most anxious one for both the Directors and the staff, on account of the unprecedented severity of the winter. This had put them to much difficulty and expense. It was not that the Company's own mains had frozen; the fault being with the consumers' pipes, owing to their not being laid sufficiently deep to fully protect them from the frost. Through this the water in them froze, causing the pipes to burst, and then no water could be obtained. The result was that at one time during the severe frost it had been almost impossible to maintain the constant supply; and this would always be the case when such a long and intense frost was experienced as that which they had gone through last winter. A large proportion of the pipes burst; the consequence being that the water was running away for 24 hours. During the severe winter which they had experienced, they had, owing to this circumstance, been delivering much more water—not into peoples' houses, it was true, but into waste—than on the driest day in the summer. The proprietors would, therefore, see that they had met with extreme difficulty; but during this trying period, they had done everything they could to supply the wants of the consumers, and more than their obligations compelled them to undertake. The past winter had, in fact, been a most unthankful one for anyone who was connected with a Water Company. However, they had gone through their troubles very well; and perhaps they ought rather to be thankful that they had not had such a winter for a long time previously. The Company's works were in splendid order. He did not care who examined them—an adverse buyer or anyone else—for they would see nothing which they could find fault with; everything, in fact, being as nearly perfect as it could be. They had now contracted for a new vertical triple expansion Worthington engine to replace two of the old-fashioned Bull engines at the Hampton Works. It was supposed that the saving of coal in the new engine would, as nearly as possible, pay the interest on its cost, besides giving a much more certain supply of water. By this he did not mean to convey that they had not had enough water. Some of the proprietors might think it was wrong in the present state of the Company to spend a large amount of money; but some months ago they felt that it was their duty to incur this outlay, and they still thought so. Tenders for the supply of coal were now under consideration; and they hoped to get more favourable terms than they obtained last year, though nothing like the low prices which prevailed some time ago. What they all wanted to know about was with reference to the Bills which had been introduced into Parliament affecting the London Water Companies; and he was afraid he could give them very little information on this point. The Committee which had been appointed was going on in rather an unusual way. They did not seem inclined to take evidence from anyone; but this saved the Companies from expense, although they had incurred considerable outlay in preparing evidence. He thought it was of no use for the Companies to fight, as the Committee had made up their minds to recommend to Parliament that their undertakings should be transferred to a public body. They would not therefore hear evidence. They hoped they would get fair terms; and he believed they would. No one alleged that there was anything the matter with the quality or the quantity of the supply afforded by the Companies. All that was said was that, although they had done very well in the past, yet it was not right that they should any longer have the supply of what was a vital necessity. It was thought by some that the public would obtain their water supply cheaper by the transfer of the Companies' undertakings to a public body. He, on the contrary, felt sure that the public would lose in every way by the change. In their own district, the consumers would at once lose their 7½ per cent. rebate; and in other districts he felt convinced that the public would not get their supply cheaper. They might get it apparently cheaper, as regarded the actual amount paid for it, though he did not think they would. The Companies paid an enormous sum for rates; and if this money were not paid by the body to whom the Companies' undertakings were transferred, it would have to be found by the ratepayers. They might also say that they would not increase the charge for water; but in Manchester and other places in the north they made an independent rate for water, whether or not the supply charged for was used. He need not say that, with a sixpenny or ninepenny rate, the water could be supplied cheaper. However, they could not help themselves; and sorry as they might all be, he felt that they must make up their minds to losing their water stock. He did not say that this event would happen all at once; but that they would lose it, he felt sure. They might rely upon it that the Directors would do their best to obtain fair terms. As far as he could understand, they would probably be offered water stock or money; but they could not say which it would be more advantageous to accept until they knew the precise terms. As the proprietors were aware, they had issued the balance of their perpetual debenture stock; and he thought they would agree that the Directors had acted wisely in this matter.

The DEPUTY-CHAIRMAN (Mr. J. Meyer) seconded the motion.

Mr. F. HARLEY thought the report was so satisfactory that the proprietors would have nothing but congratulatory remarks to make about it. He, however, thought that the interval between the declaration of the dividend and its distribution was a good deal longer than in the case of most large companies; and if the dividends were payable in the first weeks of June and December, instead of a month later, he thought the proprietors would be glad. The benefit the Company derived from money being on deposit at the Bank was so trifling that he thought the suggestion he had made might be acted upon.

The CHAIRMAN, in reply, stated that, in the present prosperous position of the Company, they could very well pay the dividend upon the day on which it was declared. He did not, however, think it would be any advantage to do so; and, moreover, they would first have to get their bye-laws altered, for it was therein provided that the dividend should be paid on Jan. 5 and July 5. He did not think the Directors would make any difficulty in, regard to the proposed change; but he doubted whether it was worth while to make such an alteration in view of the probable purchase of their undertaking within a reasonable time.

Hr. HARLEY thought it might be a good precedent to be followed if the concern passed into the hands of a public body.

The CHAIRMAN stated that, by one of the Bills which had been introduced into Parliament, it had been proposed that they should wait three months longer for their dividend; and he was anxious to put in a clause that the dividends should be paid at the same date as now. He rather doubted the wisdom of interfering with what had been going on for so many years; and formerly they could not have acted as Mr. Harley suggested, as they did not then collect their water-rates as easily as they did now.

Mr. HARLEY said he would leave the matter entirely in the hands of the Directors.

The resolution was carried unanimously.

The CHAIRMAN then proposed the payment of a dividend on the consolidated stock for the half year ending March 31 last, at the rate of 10 per cent. per annum, less income-tax.

The DEPUTY-CHAIRMAN seconded the motion, which was carried unanimously.

The retiring Directors (Messrs. Meyer, Hurt, Bodkin, and Mackinnon) were re-elected. The Auditors were also re-appointed.

On the motion of the Rev. C. W. CASS, seconded by Mr. FULLER, a vote of thanks was passed to the Chairman and Directors.

The CHAIRMAN acknowledged the compliment, and the proceedings then terminated.

MANCHESTER CORPORATION WATER SUPPLY.

The Progress of the Thirlmere Works.—Financial Results of the Past Year.

A report containing many interesting particulars as to the Thirlmere Water-Works was presented by the Water Committee at the meeting of the Manchester City Council last Wednesday. All the works to be executed have been let, and their present position is described as follows—Contract No. 1, Messrs. Morrison and Mason, contractors: Length, 7 miles 174 yards; amount, £120,972. If to this be added the work done by the previous contractors, amounting to £18,541, the total of this contract is £148,423. The total value of the work done is £135,487. The length of the tunnels is 10,112 yards, of which 10,002 yards have been driven. Contract No. 2: The weight of cast-iron pipes delivered by Messrs. Macfarlane, Strang, and Co., Limited, and by the Staveley Coal and Iron Company, Limited, under their respective contracts, regulars and irregulars, is about 55,000 tons. The value of work delivered by these firms amounts to £251,307. The approximate value of work under the contracts was assumed at £235,000. Contract No. 3, Messrs. Morrison and Mason: Length, 6 miles 1059 yards; amount, £102,315. The value of the work done up to the present time amounts to £88,796. The length of tunnelling is 3897 yards, the whole of which has been driven, and 1338 yards lined. About 4911 yards of cut and cover have been done; excepting invert, out of a length of 5529 yards, exclusive of bridges, &c., and excavation is out in advance. Out of a total length of 2100 yards of pipe laying, 1082 yards had been laid. Contract No. 4, Messrs. Monk and Newell: Length, 15 miles 638 yards; amount, £134,961. If to this be added the work done by the previous contractor, amounting to £33,237, the total amount of this contract is £168,198. The total value of work done amounts to £89,956. The length of tunnelling is 2183 yards, of which 2018 yards have been driven, and 1170 yards lined. The length of cut and cover, exclusive of bridges, &c., is 10,934 yards, of which about 6476 yards have been done excepting the invert. Out of a total length of 13,740 yards of pipe laying, 4236 yards have been laid. Contract No. 5, Messrs. M'Crea and M'Farland: Length, 16 miles 480 yards; amount £141,813. The value of work done amounts to £118,494. The length of tunnelling is 2791 yards, of which 2783 yards have been driven, and 1681 yards lined. The length of cut and cover, exclusive of bridges, &c., is 10,784 yards, of which about 9299 yards have been done. Out of a total length of 14,989 yards of pipe laying, 11,005 yards have been laid. Contract No. 6, Messrs. John Aird and Sons: Length, 14 miles 1404 yards; amount, £163,745. The value of work done is £135,317. The length of tunnelling is 2827 yards, of which 2814 yards have been driven, and 2676 yards lined. The length of cut and cover, exclusive of bridges, &c., is 17,724 yards, of which 13,817 yards have been done, and the invert put in for nearly the whole of this distance. Out of a length of 5229 yards of pipe laying, 4745 yards have been laid. Contract No. 7, Messrs. Watt and Wilson: Length, 19 miles 68 yards; amount, £142,255. The value of work done amounts to £101,605. The length of tunnelling is 3117 yards, of which 2912 yards have been driven, and 1094 yards lined. The length of cut and cover, exclusive of bridges, &c., is 10,347 yards, of which 8430 yards have been done, including the invert. Out of a length of 19,626 yards of pipe laying, 11,026 yards have been laid. Contract No. 8, Mr. William Webster: Length, 16 miles 1140 yards; amount, £92,276. The value of the work done amounts to £46,949. The length of tunnelling is 552 yards, of which 412 yards have been driven and lined. The length of cut and cover, exclusive of bridges, &c., is 5672 yards, of which 2214 yards are done, including the invert. The length of pipe laying is 23,583 yards, of which 15,380 yards have been laid. Contract No. 9 (Prestwich new reservoir), Messrs. Kirk, Knight, and Co.: Amount, £23,297. The value of work executed in connection with this contract up to the present amounts to £23,914. This work is nearly completed. Contract No. 10, Messrs. Morrison and Mason: Amount, £125,500. This contract includes the construction of roads 8 miles and 1130 yards in length, the masonry embankments at the outlet of the lake, and the discharge culvert, waste weir and water course, and other works connected with the raising of the lake. The value of work done amounts to £40,695. Considerable progress has been made

in the formation of the roads, and the works at the outlet are proceeding. Invert work and the dressing up of the land along the line of aqueduct where the work is nearly finished has, in many cases, to be completed. The length of aqueduct now approaching completion may be stated approximately as follows: Tunnels, 14 miles 200 yards, out of a total of 14 miles 839 yards. Though much lining remains to be done, a considerable length will not require lining; cut and cover, 26 miles 1451 yards, out of a total of 35 miles 1572 yards; pipe laying, 26 miles 1714 yards, out of a total of 45 miles 77 yards, making a length of 67 miles 1605 yards, out of a total of 95 miles 728 yards. The weather for months past has materially interfered with the progress of the work—in fact, it has been practically stopped during the winter months.

In moving the adoption of the Committee's report, Alderman Sir J. J. Harwood referred to the financial results of the past year's working. The receipts for water had been £232,675, as against £221,551 in the previous year—being an increase of £11,124. A very large amount of this increase arose from the fact that in 1889-90, they did all the repairs that possibly could be required at Longdendale; and the item for repairs in the past year was £5459 less. The other source of increased income was the very severe winter, during which people had allowed the water to run through their meters; and the Committee had had increased charges therefrom. The average annual increase in the receipts for water for the ten years ending 1890 was £3000; and they were sanguine that there would be a large increase in the future. If they had had to pay for Thirlmere, assuming that they obtained the relief they anticipated, of £18,000 on the sinking fund at Longdendale and £10,000 from the life annuities, they would have been able to meet their payment within about £15,000. He was very glad to say that, so far as they were able to see at present, they were justified in taking a very sanguine view of their responsibilities; and he did not think that they would be called upon to pay any serious sum for a long time. He was also glad to be able to say that the Thirlmere works were proceeding as satisfactorily as could be reasonably expected. They had their little difficulties to contend with; but they were such as any ordinary man would expect to meet with in a gigantic work of that kind. In less than two years, if nothing unforeseen and unusual occurred, they would have water from Thirlmere in abundance. The report was adopted.

NOTES FROM SCOTLAND.

From our Edinburgh Correspondent.

EDINBURGH, *Saturday*.

When I wrote last week, suggesting that the Edinburgh and Leith Gas Commissioners should re-arrange the districting of their area so as to give more to the Leith and less to the Edinburgh works, I was unaware that this had been recently done. That it is so, came out at a meeting of the Edinburgh Town Council on Tuesday. Reports by the City Analyst (Mr. J. Falconer King) were submitted to the Council, which showed that on April 14, the Edinburgh gas was of 24·30-candle power, and the Leith gas of 28-candle power; and that on April 27 they were 25·90 and 28 candle power respectively. Thereupon a member, of Radical turn of mind, wanted to know "if any member of the Gas Commission could give the Council any reason why Leith got so much better gas than Edinburgh." The answer to this was that Leith was supplied with a better class of coal; and the querist then demanded to know "why that was so." Mr. Kinloch Anderson, in explanation, attributed the low quality of the Edinburgh gas to the difficulties they had in getting in supplies of coal from certain collieries at the time it was wanted; and Mr. Mitchell Thomson also explained that last year Leith had a better supply of cannel than Edinburgh, but that in the new contracts this had been put right. The incident is chiefly noteworthy as showing that there is a spirit of distrust of the Gas Commission lingering in the community, and as a warning to Commissioners to carefully direct their steps, because there is no saying in what quarter enemies may arise.

The Dundee Gas Commission have done a good stroke of business this week in securing coal for the current twelve months at an average price of 16s. 7d. per ton, as compared with 17s. 6d. per ton for the contracts which expired in April. That they have been able to effect a reduction of 11d. per ton of coal, at a time when others are finding that they require to pay more instead of less, is a circumstance of which the Commissioners may be proud; as in all probability it will save them this year from the decided disadvantage of having to raise the price of gas. I suppose their good fortune is to be attributed to Mr. M'Crae's selection from the different samples which were offered; but it may also be that Mr. M'Crae, with his acknowledged ability, expects to get illuminating power out of coal which other engineers would be afraid to rely upon obtaining in practice. At the monthly meeting of the Commission on Wednesday, ex-Provost Brownlee, the Convener of the Works Committee, stated that they had selected coal of medium quality, which they believed would give an illuminating power of from 25 to 26 candles, which they wished to produce. The quantity contracted for is 53,000 tons, or over 10,000 tons more than were in last year's contracts. The contracts having been agreed to, the Commission proceeded to consider a question as to the quality of the gas, which was raised by one of the members stating that there were at present very serious complaints. In this matter, the Chairman (Mr. Brownlee) stated that, "by way of experiment, he instructed the Manager to reduce the illuminating power of the gas for a month to 23 or 24 candles, so as to ascertain whether the public would see any difference; and, so far as he was aware, during the time the gas was at that quality there were no complaints. After last Board meeting, however, he gave the Manager instructions to raise the illuminating power to the former standard." At which experiment the *Dundee Advertiser* waxed wroth, and next day declared that the Gas Commission had been "palming off upon the public an inferior quality of gas, after the manner, but not with the same motive, as other people pass spurious half-crowns," a castigation which was not altogether deserved when the motive which the writer seems to recognize is taken into account. That motive was evidently to ascertain, as quietly as possible, whether a reduction in quality would be tolerated; and it is quite apparent, as the outcome of Mr. Brownlee's experiment, that the outcry about inferior illuminating power of gas is to a large extent a piece of sentiment. The community of Dundee did not detect the reduction in quality; any complaints which came in were during the month in which the illuminating power had been restored to its normal figure. If the Commissioners had had the courage of their convictions, they might have at this time made a permanent reduction in the quality of their gas. They would doubtless have been subjected to a good deal of abuse over such a step; but that stage would have been passed by, and, with a reduction in price, the community would have taken to the new low-power as kindly as to the old high-power gas. A better opportunity could not have been found for making the reduction, because a corresponding reduction in price could have been made, which may not be possible at another time, when it may be found necessary to reduce the quality. Besides, the city is now practically free from competition with electric lighting; and there would have been no loss of customers on account of a reduction in quality, such as there probably would be if another light were available. So that, in all the circumstances, Mr. Brownlee's experiment was a wise one. The only pity is that it was not followed up by the action which it fully justified. In this matter the city of Edinburgh is to some extent in a position widely different from Dundee. Here, it is true, there is no electric lighting of any consequence; and upon that head alone it might have been advisable that the Gas Commissioners should have made the reduction in quality suggested by Mr. Wells, which would have gone far to keep out the competing light. But, on the other hand, the Edinburgh and Leith Gas Commissioners were not in a position to offer anything like an adequate reduction in price along with the reduction in quality, and their task would consequently have been a more difficult one than would that of the Dundee Gas Commissioners.

The Arbroath Gas Corporation on Wednesday concluded the contracts for their coal supply for the next financial year. A member raised a discussion upon the abolition of meter-rents, but nothing came of it, except the statement that the rent charged at present for an ordinary meter is 1s. per annum, which produces a rental of £208 and that many gas consumers own their meters. It was stated that a the next meeting the price of gas would probably be raised by 5d. per 1000 cubic feet.

The Aberdeen Town Council on Tuesday agreed to the proposed purchase of land at Gallowhill for the erection of additional gasholders. The land taken extends to over 10 acres, and will suffice for gasholder extensions for many years to come. It is level, and in the lowest part of the city, and besides, is only 900 yards from the gas-works. The price to be paid is £2000, with an annual feu-duty of £7 4s., which the Corporation may redeem after Whitsunday, 1892. The question with reference to the dismissal of men from the gas-works, is to be brought before the Council at a subsequent meeting.

From our Glasgow Correspondent.

GLASGOW, *Saturday*.

The Partick, Hillhead, and Maryhill Gas Company's Bill, promoted jointly by the Company and by the Glasgow Corporation, came before Lord Morley as an unopposed measure in the House of Lords last Tuesday; and after brief statements had been made by Mr. Loch and Mr. Leslie, Parliamentary Agents, the preamble of the Bill was proved by Mr. Muirhead for the Gas Company and by Mr. Bowers for the Corporation. The further consideration of the Bill was adjourned till after the Whitsuntide recess, when it is expected that the clauses will be adjusted to meet the circumstances of the gas supply in Dalmuir, Bowling, and Old Kilpatrick, as indicated in last week's "Notes."

Another decided increase in the amount of the gas-rental has just been reported to the Finance Sub-Committee of the Glasgow Gas Trust by Mr. Fleming, the Treasurer. A few days ago the total amount he had received for the year in the shape of gas-rents was £276,891 19s. 9d., against £246,353 0s. 5d. at the same time last year—the increase for rather over eleven months thus running up to £30,538 10s. 4d. On the same day it was reported that the number of stoves and range fittings on hire and in use had increased to 7954; and that the sales of stoves, range fittings, and other heating appliances amounted to 10,209.

Some notion may be formed of the extent of the operations involved in the repairing of the two damaged gasholders at the Dawsholm Gas-Works, when it is mentioned that the first instalment in payment of the contract for the timber-framing employed in connection therewith amounts to £900.

The Dumfries Corporation, at their meeting on Thursday, had the question of coal supply during the ensuing year under consideration. The Gas Committee reported that, if their Manager's (Mr. G. Malam's) recommendations as to the coals best suited to their purpose were carried out, they would not require to advance the price of gas. Mr. Malam's calculations altogether were most satisfactory. The average cost of coal at the works was 17s. 11¾d. per ton; and the average yield of gas per ton of coal was 9700 cubic feet, with an illuminating power of 26½ candles. The average price of the coal recommended was 1s. 6d. per ton more than the cost of the past year's coal.

When the Gas Committee's minutes came up at last Thursday's monthly meeting of the Glasgow Corporation, nothing was said about gas affairs; but Mr. Ure directed attention to certain recommendations of the Special Sub-Committee on Electric Lighting, and the reports of the three experts—Mr. Crompton, Professor Jamieson, and Sir William Thomson—together with a report from the Committee on the whole subject; and on his suggestion it was agreed to defer coming to any decision on the subject till the next monthly meeting of the Council.

The Glasgow pig-iron market has been very much excited during the past week; and there have been very marked fluctuations in the prices of Scotch warrants iron, ranging between 49s. per ton on Wednesday, and 47s. on Friday morning; the close in the afternoon being 48s. 6d. per ton cash buyers. The fluctuations in the prices of Cleveland and hematite iron were not nearly on such a great scale. It is felt that what speculation is afoot is very greatly antagonistic to the position and prospects of the trade. A large amount of business has been done in warrants. Three additional blast furnaces have been blown in during the week; so that there are now 60 in actual operation, against 87 at this time last year.

In some directions, the prices of coal are a little higher this week but that is thought likely to be of only temporary duration.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *May* 9.

Sulphate of Ammonia.—The market is steady at £11 at all the ports, and is likely to remain there, seeing that there is neither pressure to sell, nor urgency of demand. The marked falling off in the production is, however, becoming noticeable; and this circumstance may tell upon the market whenever an active demand sets in. Buyers meanwhile, in view of the weaker tone of nitrate, seem disposed to stand back. America is, however, an exception to this, as she is still sending orders; and from present appearances, the trade with that country may assume very large proportions. A similar view may be taken of our trade with Java. Nitrate is just steady at 8s. 10½d. per cwt. although the deliveries show a considerably increased consumption when compared with last year's figures. The stocks are, however, still in excess of last year.

LONDON, *May* 9.

Tar Products.—With the exception of pitch, which is now being sold for next season's delivery, this market is without any interesting feature. Benzol continues flat; and 50's are unsaleable. Toluol also is neglected; while solvent naphtha is offered without finding buyers, although the price has been reduced 4d. per gallon. Anthracene is moving off slowly at prices in favour of buyers. The prices being paid for renewal of tar contracts are again out of proportion to the present condition and prospects of the trade. Fortunately tar distillers have but little stock. The outlook, however, of the trade is far from encouraging. The following prices have been paid during the week: Tar, 27s. to 31s. Pitch, 34s. Benzols, 90 per cent., 4s. 1d.; 50 per cent., nominal, 3s. Toluol and solvent naphtha, 1s. 6d. Crude naphtha, 1s. 2d. Creosote, 1¼d. Carbolic crystals, 5⅜d.; crude, 60's, 1s. 6d. Cresol, 8d. Anthracene, 30 per cent., "A" quality (nominal), 1s. 4d.; "B" quality, 11d.

Sulphate of Ammonia.—There is no change for the better in this market. Notwithstanding nitrate being firmer, sulphate continues dull, and difficult of sale. The home demand has this year been extremely disappointing, probably owing to the long spell of dry, cold weather. Sales are reported at £11 to £11 3s. 9d., less discount. Gas liquor is quoted 5s. to 6s., according to position and strength.

Sale of Shares.—The Eckington and Mosboro' Gas Company having decided on raising additional capital, for the purpose of erecting a new gasholder and generally improving the plant, 400 shares of £5 each were sold by auction last Wednesday, at prices varying from £6 10s. to £6 14s. per share.

Gas Exhibition at Newcastle-under-Lyme.—During the past week an interesting and extensive exhibition of modern gas appliances for cooking, heating, lighting, and motive power, was held under the auspices of the Corporation, in the Municipal Hall at Newcastle-under-Lyme. Mr. W. O. Briggs, Chairman of the Gas Committee, and Mr. W. Winstanley, the Gas Engineer, were in charge of the arrangements. Cookery lectures and lessons were delivered twice daily.

Birkenhead Gas and Water Supply.—At the meeting of the Birkenhead Town Council last Wednesday, Mr. Bloor, in moving the adoption of the proceedings of the Gas and Water Committee said that, in regard to the supply of gas, the past financial year had been the most successful the Committee had ever experienced. There had been 423,882,000 cubic feet of gas manufactured, against 385,552,000 cubic feet in the previous year—an increase of 38,330,000 cubic feet, or very nearly 10 per cent. This was the highest rise they had had during the last ten years. The total increase in the gas manufactured since 1881 had been 177,660,000 cubic feet, or 68·2 per cent. The illuminating power of the gas was also very high—the maximum being 22·25 candles; the minimum, 19·31 candles; and the average, 20·56 candles. There had also been a large quantity of water used in the borough. The quantity in 1890 was 760,260,000 gallons; and in 1891 it was 826,337,000 gallons. A considerable proportion of this, however, was due to breakages during the frost. As to the finances of the Committee, the total receipts for gas were £81,793; and the expenditure was £72,095—leaving a net gain of £9698. The receipts for water were £26,334; the expenditure was £20,766—making a net profit of £15,276 from the Gas and Water Department. Half of this sum—£7638, went to the Borough Treasurer in relief of the rates; and the other half had gone to the account for the reduction of the price of gas and water, from which the public would ultimately receive the benefit. The proceedings were confirmed.

Southampton Gaslight and Coke Company.—The half-yearly meeting of this Company was held last Wednesday. The report of the Directors for the six months ended Dec. 31 last, showed that the amount available for dividend was £14,604; and it was recommended that maximum dividends amounting to £7229 be paid—leaving £7375 to be carried forward. The Chairman (Mr. R. C. Hankinson), in moving the adoption of the report and accounts, remarked upon the satisfactory features presented by them. The increase in the consumption of gas over the corresponding half of 1889 was no less than 9 million cubic feet, equivalent to nearly 7 per cent. The unusually severe winter accounted largely for this abnormal increase; but it was the more satisfactory as the increase was principally in the outlying districts, where they could not be touched by electricity so much as in the borough. Dr. Sampson seconded the motion. Mr. Paddon, the Consulting Engineer, gave some interesting particulars showing the increase of the Company's business during the past seventeen years. In 1873 they made just half the quantity of gas produced last year. At that time their capital amounted to £162,170. They then employed for every million cubic feet of gas sold, a capital of £1166. Since that they had doubled their business, but not their capital, which was now £254,000—just £92,000 more than in 1873. Recently they had only employed £676 of capital for every million cubic feet of gas sold. They had reduced the price from 4s. 6d. to 2s. 10d. per 1000 cubic feet; and if last year the price had been 4s. 6d. per 1000 feet, they would have received £23,000 more from the consumers. The resolution was adopted.

Guernsey in Darkness.—Owing to the dissatisfaction of the ratepayers of Guernsey at an alleged misappropriation of taxes by the State, they refused to vote the necessary funds for lighting the town. The public lamps were accordingly thrown out of use. Subsequently, however, the light was restored temporarily; but last week the ratepayers, by a majority of three to one, supported their previous action, and the town is once more in darkness.

Lincoln Corporation Gas Supply.—At the meeting of the Lincoln Town Council last Tuesday, Mr. Page, in moving the adoption of the minutes of the Gas Committee, said the Corporation would be glad to know that the accounts for the past financial year showed a favourable result. Subject to audit, they showed they had provided for the sinking fund the sum of £1920; and after this there was a clear profit of £1918. Therefore, although the price of coals had considerably increased, and some towns had been obliged to raise the price of gas, Lincoln had not had occasion to do so. Since 1885, when the Corporation purchased the gas-works, they had reduced the price of gas from 2s. 8d. to 2s. 6d. per 1000 cubic feet, and the meter-rents one-half. In addition to this, the Corporation had invested in their undertaking something like £16,000. That was to say, they paid about £11,000 to the sinking fund, the reserve fund had been increased by £1000, and at the present there was £4000 odd to the credit of the current account. The gas undertaking was therefore in a highly satisfactory condition. The result next year would depend on circumstances—partly on the state of trade and the price of coals; but the present prospects were such that they might say, at any rate, they saw their way to paying off the contribution to the sinking fund. Hitherto they had had a handsome surplus. They had allocated the sum of £10,000 for the purposes of reserve; £5000 of this was already invested in Bank of England stock; and until they had the other £5000, they should probably not appropriate the surplus revenue to any other purpose. The Mayor Mr. E. Pratt) said perhaps he might be allowed to mention that a short time ago they had in that room a meeting of the Eastern Counties Gas Managers' Association; and upon hearing the state of the gas finances and the works generally, he (the Mayor) had the pleasure of hearing the Chairman of the Gas Committee heartily congratulated on the state of things existing in Lincoln. The minutes were confirmed.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 887.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	10 Apl.	10½	Alliance & Dublin 10 p. c.	10	16—17	..	6 3 6
100,000	10	,,	7½	Do. 7 p.c	10	11½—12½	..	6 0 0
500,000	100	2 Jan.	8	Australian (Sydney) 5 % Deb.	100	100—108	..	4 12 7
100,000	20	27 Nov.	8	Bahia, Limited	20	13—15	−½	10 13 4
200,000	5	13 Nov.	7½	Bombay, Limited	5	6¾—7¼	..	5 3 5
40,000	5	,,	7½	Do. New	4	5—5⅛	..	5 9 1
380,000	Stck.	26 Feb.	12½	Brentford Consolidated	100	217—222	..	5 10 4
125,000	,,	,,	9½	Do. New	100	158—163	..	5 13 6
220,000	20	12 Mar	11½	Brighton & Hove Original	20	40—42	..	5 9 6
320,000	20	10 Apl.	11½	British	40	44—45	..	5 0 0
50,000	10	12 Mar.	11	Bromley, Ordinary 10 p. c.	10	18—20	..	5 10 0
39,000	10	,,	8	Do. 7 p. c.	10	13—15	..	5 6 8
328,750	10	13 Nov.	6	Buenos Ayres (New) Limited	10	10—11	..	5 9 1
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	100—103	..	5 16 7
150,000	20	26 Feb.	8	Cagliari, Limited	20	25—27	..	5 18 6
550,000	Stck.	10 Apl.	13⅜	Commercial, Old Stock	100	260—265	+2	5 3 9
130,000	,,	,,	10½	Do. New do.	100	198—203	+3	5 5 11
130,000	,,	30 Dec.	4½	Do. 4½ p. c. Deb. do.	100	121—126	..	3 11 5
557,320	20	30 Dec.	13	Continental Union, Limited	20	49½—50½	+½	5 2 11
242,680	20	,,	13	Do. New '69 & '72	14	—	..	—
200,000	20	,,	10	Do. 7 p. c. Perf.	20	37—39	..	5 2 6
75,000	Stck.	25 Mar.	10	Crystal Palace District	100	195—205	..	4 17 7
486,090	10	28 Jan.	4†	European, Limited	10	20—21	..	—
354,060	10	,,	4†	Do. Partly paid	7½	14½—15½	..	—
5,470,630	Stck.	12 Feb.	13	Gaslight & Coke, A, Ordinary	100	240—244	..	5 6 6
100 000	,,	,,	4	Do. B, 4 p. c. max.	100	96—99	..	4 9 10
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	255—260	+2	3 16 11
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	120—125	..	4 0 0
60,030	,,	,,	7½	Do. G, 7½ p. c. do.	100	175—180	..	4 3 4
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	160—164	..	4 5 4
463,000	,,	,,	10	Do. I, 10 p. c. Prf.	100	253—258	+2	3 17 6
476,000	,,	,,	—	Do. K, 6 p. c. Prf.	100	152—157	..	3 16 6
1,061,150	,,	12 Dec.	4	Do. 4 p. c. Deb. Stk.	100	113—118	..	3 7 10
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	122—126	..	3 11 5
908,000	,,	,,	6	Do. 6 p. c. do	100	165—170	..	3 10 6
3,800,000	Stck.	13 Nov.	12	Imperial Continental	100	234—238	..	5 0 10
75,000	5	12 Dec.	6	Malta & Mediterranean, Ltd.	5	4½—5	−¼	5 0 0
560,000	100	1 Apl.	5	Met. of Melbourne, 5 p. c. Deb.	100	110—112	..	4 9 3
541,920	20	27 Nov.	6⅔	Monte Video, Limited	20	19—20	..	6 10 0
150,000	5	27 Nov	10	Oriental, Limited	5	9—9⅛	..	5 5 3
60,000	5	25 Mar.	7	Ottoman, Limited	5	4—5	..	7 0 0
166,870	10	26 Feb.	2	Pará Limited	10	3—4	..	—
420,000	100	4 May	6	People's Gas of Chicago— 1st Mtg. Bds.	100	92—97*	..	6 3 9
500,000	100	1 Dec.	16	2nd Do.	100	93—98	..	5 2 5
150,000	10	28 Apl.	10	San Paulo, Limited	10	15⅜—16⅛*	..	6 1 2
500,000	Stck.	26 Feb.	15½	South Metropolitan, A Stock	100	282—287	..	5 8 0
1,350,000	,,	,,	12	Do. B do.	100	235—240	..	5 0 0
166,500	,,	,,	13	Do. C do.	100	242—250	..	5 4 0
678,000	,,	30 Dec.	5	Do. 5 p. c. Deb. Stk.	100	141—145	..	3 9 0
60,000	5	12 Mar.	11½	Tottenham & Edm'nton, Orig.	5	11—13	..	4 8 5
						*£2 div.		
				WATER COMPANIES.				
729,221	Stck.	30 Dec.	10	Chelsea, Ordinary	100	260—270	+5	3 14 1
1,720,560	Stck.	10 Apl.	8	East London, Ordinary	100	212—217	+4	3 13 9
544,440	,,	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	100	140—145	..	3 2 0
700,000	50	12 Dec.	9	Grand Junction	50	115—120	+2	3 15 6
708,000	Stck.	12 Feb.	10½	Kent	100	260—270	+5	3 17 10
1,043,800	100	30 Dec.	9½	Lambeth, 10 p. c. max.	100	241—246	+1	3 17 3
406,200	100	,,	7½	Do. 7½ p. c. max.	100	195—200	..	3 15 0
260,000	Stck.	25 Mar.	4	Do. 4 p. c. Deb. Stk.	100	118—123	..	3 5 0
500,000	100	12 Feb.	12½	New River, New Shares	100	345—355	..	3 8 4
1,000,000	Stck.	28 Jan.	4	Do. 4 p. c. Deb. Stk	100	125—128	..	3 2 6
902,300	Stck.	12 Dec.	7	S'thwk & V'xhall, 10 p. c. max.	100	170—175	−2½	4 0 0
126,500	100	,,	7	Do. 7½ p. c. do.	100	165—170	..	4 2 4
1,155,066	Stck	12 Dec.	10	West Middlesex	100	255—265	+5	3 15 6

† Interim dividend.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM LONDON." TELEPHONE No. 2698.

GWYNNE & CO.,

HYDRAULIC AND GAS ENGINEERS,

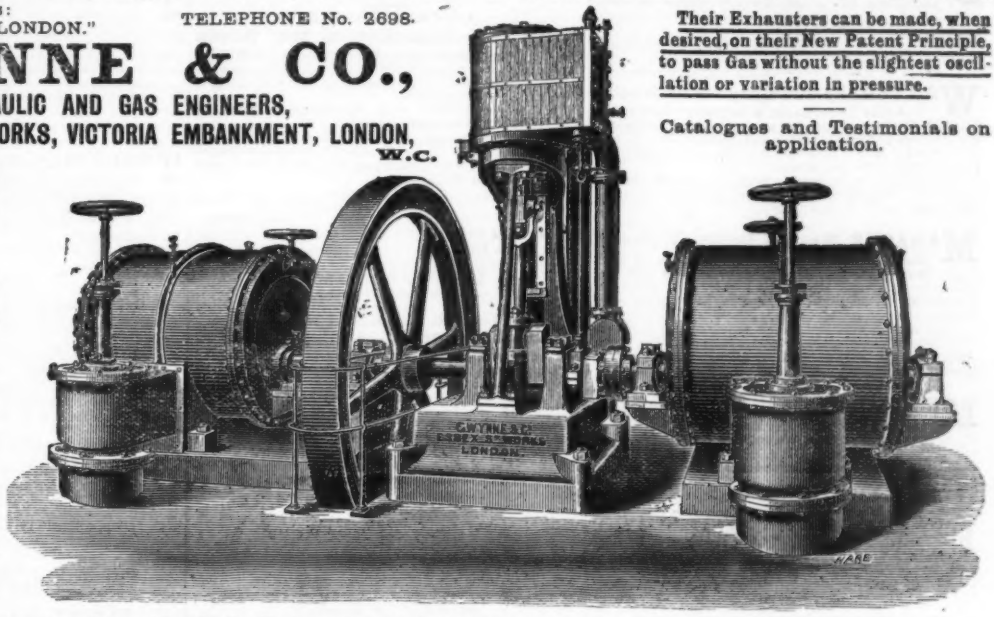
ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C.

Thirty-three Medals at all the Great International Exhibitions have been awarded to GWYNNE & Co. for Gas Exhausters, &c.

They have completed Exhausters to the extent of 20,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, STEAM-PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH-SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.



Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

Catalogues and Testimonials on application.

Exhausting Machinery at Fulham and Bromley Gas-Works—each set passing 400,000 cub. ft. per hour, drawing 14 miles distant from Beckton.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

ANDREW STEPHENSON, Agent for the GAS PURIFICATION AND CHEMICAL COMPANY, Ltd., Palmerston Buildings, LONDON, E.C.

ANDREW STEPHENSON, Agent for BRIN'S OXYGEN COMPANY, Limited, Westminster, S.W.
City Address: 182, Gresham House, Old Broad Street, LONDON, E.C.

CANNEL COAL, ETC.

JOHN ROMANS & SON, EDINBURGH. Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.
Prices, &c., will be forwarded on application to No. 90, ST. ANDREW SQUARE, EDINBURGH, / NEWTON GRANGE, NEAR DALKEITH, } SCOTLAND.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 85, Gracechurch Street, LONDON; 70, Wellington Street, GLASGOW; 58, Fountain Street, MANCHESTER; and 96, Reade Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

TAR and Liquor wanted. BROTHERTON AND CO., Commercial Buildings, LEEDS.

WANTED, a steady and trustworthy GAS STOKER (Shovel charging). Permanent employment. One accustomed to Engine and Exhauster preferred. Wages 37s. per week.
Apply, stating age and experience, and giving reference, to JOHN COCKCROFT, Manager, Gas-Works, Littleborough, near MANCHESTER.

JAMES LAWRIE & CO. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK: COKE BARROWS, BOGIES, and SMALL WAGONS.
Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON, Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p 917 of this week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock, Oldham."

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FOR Gas, Steam, and Water; Galvanized, White Enamelled, and Hydraulic Tubes, &c.
JOHN SPENCER, Globe Tube Works, WEDNESBURY, and 14, Great St. Thomas Apostle, LONDON.

COZE'S Automatic Apparatus for CHARGING AND DISCHARGING GAS-RETORTS. For Illustrated Advertisement of this System, see p. 861.
Inquiries should be addressed to THE AUTOMATIC COAL-GAS RETORT COMPANY, LIMITED, 86-88A, LEADENHALL STREET, E.C.

RAILWAY Tanks on Hire. Address BROTHERTON AND CO., Ammonia and Tar Distillers, LEEDS.

WANTED, a capable Tinman, who can repair Wet and Dry Gas-Meters, and also test same.
Apply, stating age and wages required, to the ENGINEER, Gas-Works, STAFFORD.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. OXIDE PAINT, SULPHURIC ACID, & Chemicals.
120 and 121, NEWGATE STREET, LONDON, E.C.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

JOHN RILEY & SONS, Chemical Manu- facturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

HUTCHINSON BROTHERS, Barnsley, Gas Engineers and Contractors, Makers of Wet and Dry Gas-Meters and General Gas Apparatus, Sulphate of Ammonia Plant, Lead Saturators, Tanks, &c., Tools and Sundries.

OXIDE OF IRON.

GENUINE Natural Bog Ore. Quality and condition guaranteed. Any quantity supplied at lowest rates.
D. M. NELSON AND SONS, GLASGOW. Telegraphic Address: "Gas Glasgow." Depôts throughout England and Scotland.

WANTED, a Working Foreman and GAS-FITTER. Must be active and steady; first-class carbonizer; capable of doing works repairs, main and service laying, reading and fixing meters, &c.
Apply at once, in own handwriting, giving age, references, &c., to the MANAGER, Gas-Works, HALESOWEN.

ASSISTANT wanted in Civil Engineer's Office, Twelve miles from London. Must be a good Draughtsman and Correspondent, and have a thorough knowledge of Gas Plant.
Apply, by letter, stating previous experience, age, &c., to No. 1949, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

Price 3s. 6d. post free (76 Pages, Demy 8vo., Limp Cloth),

THE

VALUATION OF GAS-WORKS FOR ASSESSMENT,

By THOMAS NEWBIGGING, M. Inst. C.E.,

With an Appendix containing a Statement of the most Important Cases bearing on the Question, and decided by the Superior Courts. Each of these is preceded by a Digest; and the Judgments are given in full.

Price: Morocco, Gilt, 18s.; Cloth, 15s.; Delivered Free.

THE FIFTH EDITION OF THE

HANDBOOK

FOR

Gas Engineers and Managers,

BY

THOMAS NEWBIGGING, M. Inst. C.E.

LONDON: WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

DRAUGHTSMAN Wanted, in a provincial town for about Two or Three months, accustomed to Gas-Works. State age, salary required, with experience and reference.

Address 1891, care of Messrs. Street, 30, CORNHILL, E.C.

WANTED, by the Congleton Corporation Gas Department, a thoroughly competent GAS-FITTER. Must be a good Compo. Worker, accustomed to fixing Cooking and Heating Stoves, and able to take Meter Indexes, &c. Permanent employment. Wages 25s. per week.

Applications, with testimonials, to be sent in not later than Wednesday, the 20th inst., addressed to the Chairman, A. W. RADLEY, Esq.

MANAGER Wanted, for Gas-Works in the West of England. Annual make, 11 millions. Must have had experience of Engine and Exhauster, and also of Sulphate making. Must be competent to take entire management of Works, read Meters, and collect Accounts.

Applications, stating salary required, with copies only of testimonials, to be sent not later than Thursday, May 21, to No. 1948, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

MERCHANT, who visits the Continent twice in the year, and does a large business in all Articles of the Gas, Water, and Sanitary Trades, wants the SOLE SALE OR AGENCY OF ARTICLES belonging to the above. First-class references can be given.

Address H. J. 1105, care of RUDOLF MOSSE, HAMBURG.

FOR SALE—A Second-hand 8-inch CENTRE-VALVE with CONNECTIONS, complete and in good condition.

For price, &c., apply to the WATER AND GAS COMPANY, LOWESTOFT.

FOR SALE, very cheap—A second-hand patent ROTARY WASHER, in good condition. Capacity, quarter of a million per diem. Also a STATION GOVERNOR of the same capacity.

For price, &c., either as they stand, or overhauled and put in good working order, apply, by letter, to No. 1937, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CORPORATION OF HEYWOOD.

THE Gas Committee invite Tenders for the following:—

Contract No. 1—8500 tons of Gas Coal, and 500 tons of Cannel.
" No. 2—100 tons of Vitriol.
" No. 3—Cast-Iron Mains and Specials.

Specifications and forms of tender may be obtained on application to Mr. Whatmough, Gas Manager.

Sealed tenders, endorsed with the name of the articles tendered for, to be delivered to me not later than Tuesday, May 19, 1891.

By order,
ALFRED WALLIS, Town Clerk.

Municipal Buildings,
Heywood, May 1, 1891.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Corporation of Birkenhead are prepared to receive TENDERS for the supply of Screened COAL, COAL NUTS, CANNEL, and CANNEL NUTS, for gas-making purposes, for a period of One, Two, or Three years, commencing from the 26th of June, 1891.

Forms of tender, together with any further information, may be obtained from Mr. T. O. Paterson, C.E., Gas Engineer, Gas-Works, Birkenhead.

Tenders (accompanied by copy of Analysis), stating the price per ton delivered on to the Gas-Works Railway Siding, must be sent in to me, sealed and endorsed "Tender for Gas-Works Coal," not later than Five o'clock in the afternoon of Friday, the 22nd of May, 1891.

Also for a supply of STEAM COAL and SLACK, to be delivered at the Pumping-Stations of the Spring Hill, Flaybrick Hill, and Borough Road Water-Works, for a period of One, Two, or Three years, commencing from the 26th of June, 1891.

Forms of tender, together with any further information, may be obtained from Mr. W. A. Richardson, C.E., Water Engineer, Town Hall, Birkenhead.

Tenders, stating the price per ton delivered at the various Pumping-Stations, must be sent in to me, sealed and endorsed "Tender for Water-Works Coal," not later than Five o'clock in the afternoon of Friday, the 22nd of May, 1891.

Deliveries to be made from time to time according to the requirements of the respective Engineers.

The Corporation do not bind themselves to accept the lowest or any tender.

By order,
ALFRED GILL,
Town Clerk.

Town Hall, Birkenhead,
May 4, 1891.

TO TAR DISTILLERS AND OTHERS.

THE Corporation of Birkenhead invite OFFERS for the purchase and removal of the surplus TAR produced at their Gas-Works, during a period of One year, commencing on the 1st of July, 1891.

Deliveries will be made at the Gas-Works either into Contractor's tanks on the Gas-Works Railway Siding, or into tanks for conveyance by road to boats.

Forms of tender and further particulars may be obtained from the Gas Engineer, Mr. T. O. Paterson, C.E., Gas Works, Thomas Street.

Tenders, sealed, and endorsed "Tender for Tar," to be sent in to me, not later than Five p.m, on Friday, the 22nd of May, 1891.

The Corporation do not bind themselves to accept the highest or any offer.

By order,
ALFRED GILL,
Town Clerk.

Town Hall, Birkenhead,
May 9, 1891.

BOROUGH OF NELSON.
(GAS DEPARTMENT.)

SCRUBBER-WASHER.

THE Gas Committee of the Nelson Corporation are prepared to receive TENDERS for the erection of a SCRUBBER-WASHER (capacity 1 million feet in 24 hours), fixed on foundations prepared by the Corporation.

Further particulars may be obtained from the Engineer, Mr. Wm. Foster.

Tenders, under seal, endorsed "Scrubber-Washer," and addressed to the undersigned, must be lodged in the Town Clerk's Office, Town Hall, Nelson, not later than the 20th of May.

By order,
R. M. PRESCOTT,
Town Clerk.

Town Hall, Nelson,
May 5, 1891.

BOROUGH OF NELSON.
(GAS DEPARTMENT.)

ENGINE AND EXHAUSTER.

THE Gas Committee of the Nelson Corporation are prepared to receive TENDERS to supply and fix, on foundations prepared by the Corporation, an ENGINE and EXHAUSTER, capable of passing 60,000 cubic feet of gas per hour.

Plan and specification of Engine and Exhauster to accompany tender.

Further particulars can be obtained from the Gas Engineer, Mr. Wm. Foster.

Tenders, under seal, endorsed "Engine and Exhauster," and addressed to the undersigned, must be lodged in the Town Clerk's Office, Town Hall, Nelson, later than the 20th of May.

By order,
R. M. PRESCOTT,
Town Clerk.

Town Hall, Nelson,
May 5, 1891.

BOROUGH OF NELSON.
(GAS DEPARTMENT.)

SATURATOR.

THE Gas Committee of the Nelson Corporation are prepared to receive TENDERS for the supply of a new SATURATOR on the most improved principle.

Plan and specification to accompany tender.

Further particulars can be obtained from the Gas Engineer, Mr. Wm. Foster.

Tenders, under seal, endorsed "Saturator," and addressed to the undersigned, must be lodged in the Town Clerk's Office, Town Hall, Nelson, not later than the 20th of May.

By order,
R. M. PRESCOTT,
Town Clerk.

Town Hall, Nelson,
May 5, 1891.

BRISTOL UNITED GASLIGHT COMPANY.

TENDERS FOR WHITE LIME.

THE Directors of the above Company are prepared to receive TENDERS for the supply of their requirements (say, 5500 tons) of the Best Hand-Picked WHITE LIME, during a period of One year, commencing the 1st of July next.

Particulars and forms of tender may be obtained on application to the undersigned, to whom also tenders, sealed, and endorsed "Tender for Lime," must be delivered not later than Ten a.m., on Monday, the 1st day of June next.

JAS. V. GREEN,
Secretary.

Gaslight Offices, Canons' Marsh,
Bristol, May 6, 1891.

BRISTOL UNITED GASLIGHT COMPANY.

TENDERS FOR GAS COALS AND CANNEL.

THE Directors of the above Company are prepared to receive TENDERS for the supply of their requirements (say, 180,000 tons) of GAS COALS during a period of One year, commencing the 1st of July next.

Preference will be given to offers of 20,000 tons and upwards.

Particulars and forms of tender may be obtained on application to the undersigned, to whom also tenders, sealed, and endorsed "Tender for Coal," must be delivered not later than Ten a.m., on Monday, the 15th day of June next.

JAS. V. GREEN,
Secretary.

Gaslight Offices, Canons' Marsh,
Bristol, May 6, 1891.

UXBRIDGE & HILLINGDON GAS CONSUMERS' COMPANY.

GAS COAL.

THE Directors of the above Company invite TENDERS for the supply of 4000 tons of GAS COAL, deliveries of which are to commence the first week of July, 1891, and finish the last week in May, 1892.

Tenders to be made out for the above quantity of best South Yorkshire unscreened Silkstone Gas Coal, delivered in trucks free at Uxbridge Station, G.W.R., each ton to contain 21 cwt.

Tenders are to state the names of the Pits from which the above description of coal will be supplied, the same to be fresh wrought, and free from slate and other impurities, and to the entire satisfaction of the Company's Engineer.

Deliveries to be made according to the requirements of the Company.

Tenders to be received on or before the 5th day of June next, addressed to the Chairman, Gas Offices, Uxbridge, Middlesex, and endorsed "Tender for Coal."

A form of tender will be sent on application.

W. & W. M. GARDINER,
Secretaries.

Uxbridge, Middlesex,
May 8, 1891.

TENDERS FOR COALS AND NUTS.

THE Market Rasen New Lighting Company invite TENDERS for the supply of about 600 tons of screened GAS COAL, 200 tons of screened GAS NUTS, COALS, and NUTS delivered (21 cwt. per ton) at Market Rasen Station, commencing in July, and ending on June 30, 1892.

Further information may be obtained on application to the Manager at the Works.

JOSEPH HARPER,
Manager.

TENDERS are required for supplying the Wollaston Gas Company with about 300 tons, more or less (of 21 cwt. to the ton), of good GAS COAL from July 1, 1891, to June 30, 1892.

The Coal to be delivered at the L. & N.W. Station, Wellingborough.

The tenders to be delivered not later than the 25th of May inst., to

THOMAS ARCHER,
Secretary,

55, Oxford Street,
Wellingborough.

FARNWORTH AND KEARSLEY GAS COMPANY.

THE Directors of the Farnworth and Kearsley Gas Company are prepared to receive TENDERS for the surplus of TAR and AMMONIACAL LIQUOR produced at their Works, for One or Two years.

Sealed tenders, addressed to the Chairman, James Warburton, Esq., to be delivered on or before Wednesday, the 27th inst.

Any further information required may be obtained from the undersigned.

T. L. SHEPPARD, Manager.

Gas Offices, Farnworth, near Bolton,
May 11, 1891.

CAMBRIDGE UNIVERSITY AND TOWN GAS-LIGHT COMPANY.

TO TAR DISTILLERS AND OTHERS.

THE Directors of this Company will, at their Meeting on June 4, be prepared to receive TENDERS for the surplus TAR and the whole of the AMMONIACAL LIQUOR produced at these Works, for a period of One year, from July 1 next ensuing.

Further particulars may be had from the undersigned.

WILLIAM DUESBURY, Manager.

Gas-Works, Cambridge, May 5, 1891.

TENDERS FOR GAS COAL.

THE Totnes Gas Company invite TENDERS for the supply of about 1200 tons of best screened ARLEY or ALDWARKE COAL, or best NEWCASTLE or other good GAS COAL.

Tenders to be for price f.o.b., also price delivered free at Totnes Quay, between the 1st of June and the 31st day of October next, accompanied by working analysis.

No tender necessarily accepted.

Tenders to be delivered by the 21st of May, 1891, addressed to the MANAGER Gas-Works, Totnes, DEVON.

May 8, 1891.

TENDERS FOR GAS COALS.

THE Directors of the Petworth Coal, Gas, and Coke Company are open to receive TENDERS for the supply of 900 tons of EAST PONTOP, PELAW MAIN, WALLSEND, or other GAS COAL of equal quality; 600 tons to be delivered at the Petworth Railway Station during the months of August, September, and October next, and 300 tons early in 1892.

Tenders for the whole or each quantity separately, addressed to the undersigned, to be sent on or before the 29th inst.

WALTER BUCKMAN,
Secretary.

Petworth, May 5, 1891.

TENDERS FOR GAS COAL.

THE Directors of the Tamworth Gas- light and Coke Company invite TENDERS for the supply of 2000 tons of good GAS COAL, at per ton of 21 cwt., delivered free at either the London and North-Western Railway or Midland Stations, at such times and in such quantities as may be required.

The contract to commence as from the 1st day of July, 1891, and continue until July 1, 1892.

Tenders, with name of Colliery, analysis of Coal proposed to be supplied, and endorsed "Tender for Gas Coal," to be sent to me on or before June 1 next, on printed forms to be had on application.

The Directors do not bind themselves to accept the lowest or any tender.

By order,
WILLIAM ARNOLD,
Secretary.

23, George Street, Tamworth,
May 7, 1891.

CITY OF HEREFORD.

THE Gas Management Committee of the Corporation invite TENDERS for the supply of best screened NORTH WALES GAS COAL for One, Two, or Three years from the 1st of August next, to be delivered free at the Gas-Works Siding, Hereford, in such quantities as may be required from time to time.

The estimated quantity required will be about 6000 tons per annum.

Full particulars and printed forms of tender may be obtained on application to the undersigned.

Tenders, endorsed "Tender for Gas Coal," are to be sent in, addressed to the Chairman, Gas Management Committee, Mansion House, Hereford, by Saturday, May 23.

The Committee do not bind themselves to accept the lowest or any tender.

By order,
WILLIAM PARLBY,
Gas Engineer and Manager.

Gas-Works, Hereford,
May 6, 1891.

BOROUGH OF ROTHERHAM.

GAS-WORKS.

THE Gas-Works Committee are prepared to receive TENDERS (from makers only) for 2500 square feet of WOODEN SIEVES for PURIFIERS.

Drawings, specification, and form of tender may be obtained on application to the Manager of the Gas-Works.

Tenders to be sent in to me not later than Wednesday, the 20th of May inst., endorsed "Tender for Wooden Sieves."

The Committee require the services of a RETORT-SETTER. Constant employment (54 hours per week). Apply, stating age, experience, and wages required, with references, to the Manager.

By order,
H. H. HICKMOTT,
Town Clerk.

Council Hall, Rotherham,
May 7, 1891.

TO PIPELAYERS, &c.

THE Aberdare Gas Company invite TENDERS for TAKING UP the present 10-INCH TRUNK STREET MAIN from the Works, and for LAYING about 1520 yards of NEW 14-INCH in substitution thereof in the same trench.

Specification may be seen at the Gas Office, Aberdare. For form of tender, apply to

EVAN JONES,
Manager to the Company.

May 9, 1891.

TO TAR DISTILLERS AND MANUFACTURING CHEMISTS.

THE Directors of the Wellington (Salop) Coal and Gaslight Company invite TENDERS for the purchase of the surplus TAR to be produced at their Works for One year from the 1st of June next.

Particulars may be obtained from the undersigned, to whom tenders should be sent on or before May 26.

JNO. C. BELTON, Manager.

Gas Office, Market Street, Wellington,
Salop, May 6, 1891.

IRON ROOF.

THE Directors of the Preston Gas Company are prepared to receive TENDERS for the supply and erection of the IRONWORK, &c., for a ROOF over the Retort-House of their Works, situate in Moor Lane, in Preston.

Plans and specification may be seen at the Office of the undersigned, on and after Wednesday, the 13th inst.

Tenders, addressed to the Chairman, and endorsed "Tender for Roof," must be delivered on or before Wednesday, the 3rd day of June next.

HENRY GREEN, Engineer.

May 4, 1891.

TENDERS FOR COAL.

THE Directors of the Town of Dudley Gaslight Company are prepared to receive TENDERS for the supply of 12,000 tons of GAS COAL, to be delivered at the London and North-Western Railway or Great Western Railway Sidings, Dudley, in such quantities as may be required from the 1st of July, 1891, to the 30th of June, 1892.

Sealed tenders, addressed to the Chairman, and endorsed "Tender for Coal," to be sent in not later than the 19th inst.

The Directors do not bind themselves to accept the lowest or any tender, and reserve to themselves the right to divide the contract between two or more firms.

By order,
T. E. STILLARD,
Secretary.

Gas-Works, Dudley,
May 6, 1891.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Leek Improvement Commissioners invite TENDERS for the supply of Best Screened GAS COAL and CANNEL for One, Two, or Three years from the 1st of July next, to be delivered at the Leek Station, on the North Staffordshire Railway, at such times and in such quantities as may be required.

Annual consumption, about 4000 to 4500 tons of Coal, and 1000 tons of Cannel.

Further particulars and forms of tender may be obtained from the undersigned.

Sealed and endorsed tenders, addressed to the Chairman of the Gas Committee, Town Hall, Leek, to be delivered by Four o'clock in the afternoon of Thursday, the 21st of May inst.

The lowest or any tender will not necessarily be accepted.

By order,
C. HENSHAW, Clerk.

Town Hall, Leek,
May 4, 1891.

CARDIFF GASLIGHT AND COKE COMPANY.

TENDERS FOR COALS.

THE Directors of the above Company are prepared to receive TENDERS for a supply of 50,000 tons of best well-screened large GAS COALS, to be delivered between July, 1891, and the 30th of June, 1892, in monthly quantities, in accordance with the specification.

Parties tendering may do so for the whole quantity or for quantities from 5000 tons upwards.

Forms of tender and specification of monthly deliveries may be obtained on application to Mr. H. Morley, the Company's Engineer.

Sealed tenders to be sent to the undersigned not later than Thursday, the 4th day of June next, addressed to the Chairman of the Company, and endorsed "Tender for Coal."

The Directors do not bind themselves to accept the lowest or any tender, and reserve to themselves the right to apportion the whole quantity as they may think fit.

By order,
GEORGE CLARRY,
Secretary.

Gas Offices, Cardiff,
May 2, 1891.

TAUNTON GASLIGHT AND COKE COMPANY.

TENDERS FOR COAL.

THE Directors are prepared to receive TENDERS for the supply of COAL over One year, commencing the 1st of July next.

Particulars may be obtained of the undersigned, to whom sealed tenders are to be sent on the 1st of June next.

ALFRED EDWARDS,
Secretary and Manager.

May 9, 1891.

LURGAN GAS, LIGHT, AND CHEMICAL COMPANY, LIMITED.

THE Directors are anxious to procure TENDERS for the supply of 2750 tons of best screened GAS COAL, delivered into Lighters *ex* Ship at Belfast, free of all charges.

Delivery of 2000 tons will be taken before the 1st of November next; the remainder to be delivered at such times before the 1st of March, 1892, as may be required.

Vessels carrying from 250 to 350 tons can at once deliver into Lighters, and these Lighters be back for a further cargo within a period to be arranged.

Tenders (in sealed envelope), accompanied by reference to Gas-Works using the Coal offered, should reach me not later than Ten o'clock in the forenoon of Monday, the 1st of June next.

The Directors do not bind themselves to accept the lowest or any tender.

FRED. W. MAGAHAN,
Secretary.

Gas-Works, Lurgan,
May 5, 1891.

BOROUGH OF DEWSBURY.

THE Gas Committee invite Tenders for the supply of RETORTS, FIRE-BRICKS, &c.

Particulars of quantities and forms of tender may be obtained from Mr. Chas. A. Craven, Engineer and Manager, Savile Town Gas-Works, Dewsbury.

Sealed tenders, endorsed "Tender for Retorts," to be sent to me the undersigned not later than Saturday, the 16th inst.

The lowest or any tender will not necessarily be accepted.

By order,
ERNEST MAWDESLEY,
Town Clerk.

Town Clerk's Office, Dewsbury,
May, 1891.

BOROUGH OF DEWSBURY.

THE Gas Committee are prepared to receive TENDERS for the supply and delivery at their Gas-Works, Savile Town, near Dewsbury, of the following quantities of GAS COAL and CANNEL, during a period of One, or of Two, or of Three years, commencing on the 1st day of July next:—

	Coal.	Cannel.
First Year . .	16,500 tons.	.. 1,500 tons.
Second „ . .	17,000 „	.. 2,000 „
Third „ . .	18,000 „	.. 2,000 „

Tenders must specify prices for delivery by Road, or by Water, or by Rail, and be made on forms to be had on application to Mr. Chas. A. Craven, Engineer and Manager, Savile Town Gas-Works, Dewsbury, from whom any further information can be obtained.

Tenders, under sealed cover, endorsed "Tender for Coal Supply," to be sent to the Town Clerk, Dewsbury, not later than Saturday, the 16th day of May next.

The lowest or any tender will not necessarily be accepted.

By order,
ERNEST MAWDESLEY,
Town Clerk.

Town Clerk's Office, Town Hall,
Dewsbury, April, 1891.

CORPORATION OF NOTTINGHAM.
(GAS DEPARTMENT.)

TENDERS FOR COAL.

THE Gas Committee are desirous to receive OFFERS for supplies of COALS, COBBLES, or NUTS for the period terminating the 30th of June, 1892.

The large Coals and the Cobbles or Nuts are to be separately delivered, where and as from time to time directed, by and at the expense of the Contractors, upon the Gas-Works Siding, Great Northern Railway, in the East Croft, at Nottingham, and also on the Gas-Works Sidings, Midland Railway, at Radford and Basford respectively; and at and after the rate of one-eighth part of such total quantity in each calendar month, commencing with the month of July next, till the Corporation shall be satisfied with the amount of accumulated Stock, and afterwards at such rate as shall be from time to time directed, till the agreed quantity shall have been delivered.

The Coals, Cobbles, or Nuts are to be the best of their respective kinds, well screened (description, sizes, and inclination of screen to be specified), to be as free as possible from sulphur, bats, bind, refuse, and dirt, and shall be weighed (20 cwt. to the ton) upon the Corporation machines, or upon such other machines as may be mutually agreed upon.

Payments will be made monthly, if and so long as the contract shall be duly fulfilled.

The Corporation do not bind themselves to accept the lowest or any tender.

Further information, and forms on which the tenders must be made, may be obtained on application to me, at the General Manager's Office; and the tenders (sealed), specifying the description of coals, the seam and the pits at which they are to be raised, and stating the prices for deliveries at the several places and in manner and subject to the conditions aforesaid, must be delivered to Samuel George Johnson, Esq., Town Clerk, on or before Monday, the 18th day of May, 1891.

By order,
WILLIAM REGINALD CHESTER,
Engineer and General Manager.

Corporation Gas Offices, George Street,
Nottingham, May 7, 1891.

THE Hindley Local Board are prepared to receive TENDERS for the repairing of the GASHOLDER at the Hindley Gas-Works.

For particulars, apply to Mr. Dickinson, Gas and Water Manager.

Sealed tenders to be sent to the undersigned, not later than May 18, 1891.

By order,
STEPHEN HOLT,
Clerk.

Offices: Cross Street, Hindley,
May 1, 1891.

COUNTY BOROUGH OF OLDHAM.

THE Gas-Works Committee are prepared to receive TENDERS for the supply of about 93,000 tons of CANNEL and COAL required by them during the year ending June 30, 1892.

Specifications and forms of tender can be obtained on application to Mr. Herbert Andrew, Gas and Water Offices, Oldham, to whom tenders are to be sent on or before Tuesday, May 19, 1891.

A. NICHOLSON,
Town Clerk.

Oldham, May 1, 1891.

TAR AND AMMONIACAL LIQUOR.

THE Directors of the Accrington Gas and Water Works Company invite TENDERS for the TAR and AMMONIACAL LIQUOR which may be produced at their Accrington and Great Harwood Works during One year, commencing on the 1st of July, next.

Production of Tar, about 600 tons at Accrington, and about 500 tons at Great Harwood. Ammoniacal Liquor, about 1650 tons at Accrington, and 1150 tons at Great Harwood.

Tenders, endorsed "Tar and Liquor," must be in my hands not later than Wednesday, the 13th inst., addressed to the Chairman, Gas-Works, Accrington.

By order,
CHARLES HARRISON,
Secretary and Manager.

May 1, 1891.

TENDERS FOR COAL.

THE Scarborough Gas Company invite TENDERS for the supply of about 17,000 tons or upwards of best screened GAS COAL or COBBLES per annum for One or Two years from the 1st day of July next.

Tenders, endorsed "Tender for Coal," must be delivered at the Company's Offices, not later than Ten o'clock a.m. on Monday, the 18th inst.

The Directors do not bind themselves to accept the lowest or any tender.

By order,
WILLIAM J. MOON,
Secretary and Manager.

Scarborough,
May 1, 1891.

STALYBRIDGE CORPORATION.
(GAS DEPARTMENT.)

THREE-LIFT GASHOLDER.

THE Gas Committee invite Tenders for the erection of a GASHOLDER of Three Lifts. Diameter of outer lift 127 ft. 6 in.; contents, about ¾ million cubic feet.

Specification and drawings may be seen on application to the Engineer; and quantities and form of tender can be obtained on payment of the sum of One Guinea, which will be returned on a *bond fide* tender being sent in.

Tenders to be sent in on or before Tuesday, the 26th of May, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Gasholder."

The Committee do not bind themselves to accept the lowest or any tender.

By order,
ERNEST A. LOAM,
Engineer.

Stalybridge Corporation Gas-Works,
April 29, 1891.

IMPERIAL CONTINENTAL GAS ASSOCIATION.
INCORPORATED BY ACT OF PARLIAMENT.

NOTICE is hereby given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Association was held at the City Terminus Hotel, Cannon Street, London, on Tuesday, the 5th inst.

Sir JULIAN GOLDSMID, Bart., M.P., in the Chair,

When the following RESOLUTIONS were unanimously passed:—

"That the Report of the Directors upon the affairs of the Association be received, adopted, and entered upon the Minutes."

"That a Dividend of £5 per cent., and a Bonus of £1 per cent., for the Half-Year ended the 31st of December last, be declared upon the £3,800,000 Stock of the Association, and that the same be payable, free of Income-Tax, on and after the 1st of June next."

"That Thos. Henry Goodwin Newton, Esq., be re-elected a Director of the Association."

"That Colonel J. Wilkinson, be re-elected a Director of the Association."

"That Arthur Lucas, Esq., C.E., be re-elected a Director of the Association."

"That Joseph Sebag Montefiore, Esq., be re-elected an Auditor of the Association."

"That the cordial thanks of the Meeting be given to the Directors for their able management of the affairs of the Association, to the Chairman for his conduct in the Chair this day, to Mr. H. V. Lindon, Mr. L. G. Drory, the Agents, Engineers, and other Officers of the Association on the Continent, and to the Secretary and the London Staff."

By order of the Board,
R. S. GARDINER,
Secretary.

20, Clements Lane, Lombard Street,
London, E.C., May 6, 1891.

LEA BRIDGE DISTRICT GAS COMPANY.

BY ORDER OF THE DIRECTORS.

Sale of 600 £10 Shares, part of the further additional share capital authorized by the Lea Bridge Gas Act, 1878, ranking for a dividend of 7 per cent. per annum, subject to usual sliding scale clauses.

MR. ALFRED RICHARDS will Sell the above BY AUCTION, at the Mart, Tokenhouse Yard, E.C., on Thursday, May 28, 1891, at Two o'clock precisely, in lots.

Particulars may be obtained of RICHARD SANDELL, Esq., at the Company's Offices, 3, Jeffrey's Square, St. Mary Axe, E.C., and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

A NUMBER OF VERY FINE GAS-ENGINES FOR SALE.

MESSRS. SNOWBALL & Co., Mechanical Valuers, &c., Crown Chambers Side, Newcastle-on-Tyne, have been instructed TO SELL BY PRIVATE TREATY THE ENTIRE STOCK OF ENGINES, &c., belonging to the Estate of the "Beck" Gas-Engine Company, Limited, in liquidation.

The Engines range from 1 to 16 horse power, and are well worth the attention of buyers. There is also a considerable stock of finished parts, from which several complete Engines might be constructed.

N.B.—The British and Foreign Patents are likewise for sale.

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THE COMPOSITION AND USE OF GAS LIME IN AGRICULTURE. By (the late) Dr. A. VOELCKER, Professor of Chemistry to the Royal Agricultural Society of England. Price 5s. per 100, post free.

THE VALUE OF SULPHATE OF AMMONIA AS A MANURE. By F. J. LLOYD, F.C.S., Consulting Chemist to the British Dairy Farmers Association, Lecturer on Agriculture at King's College, &c. Price 5s. per 100, post free.

THE USE OF SULPHATE OF AMMONIA AS A MANURE. By WILLIAM ARNOLD, Chairman of the Tamworth Gas Company. Price 2s. 6d. per 100, post free.

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Price 2s. per dozen, or 10s. 6d. per 100, post free.

CONSPIRACY and Protection of Property Act. It is required, under a Penalty of FIVE POUNDS, that a Printed Copy of the 4th Section of this Act shall be posted up at all Gas-Works, in a conspicuous place, where the same may be conveniently read by the persons employed thereat.

Printed copies of this Section, in large type, on broad sheets, may be obtained of WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

*** *The Act extends to Scotland and Ireland.*

MR. W. H. BENNETT having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their Inventions may be secured for Twelve months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

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Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

NOTICE.

GAS, WATER, AND ELECTRIC LIGHTING COMPANIES' DIRECTORY, 1891.

The Editor will feel greatly obliged if Officials of Gas and Water Undertakings, who have not yet done so,

WILL RETURN THE FORMS,

corrected, for the 1891 "DIRECTORY" and "STATISTICS" on or before Saturday, the 16th of May.

OFFICES:

1, CREED LANE, LONDON, E.C.

THOMAS LIGHTING Co., LTD.,
15, CARTHUSIAN ST.,
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Special quotations to Gas Companies.

JAMES OAKES & Co.,
ALFRETON IRON-WORKS, DERBYSHIRE,
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Wenlock Iron Wharf, 21 & 22, Wharf Road,
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Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1¼ to 48 inches in diameter; and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers, and rendering leakage impossible.

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Illuminating Power - - - - - 26 Candles.
Coke per Ton, - - - - - - - 57 per cent. of a quality almost equal to that made from the best Coking Coal.

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Makers of the most perfect form of Apparatus for the Manufacture of Sulphate, Muriate, Liquid Ammonia, and Tar Products.

Apparatus already erected have proved more economical in consumption of Fuel, Simplicity and Cheapness of Working than any known Plant.

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HOLMSIDE GAS COALS.

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PRESENT production nearly 3000 tons per working day. Area of coal about 5000 acres, including the largest remaining workable proportion of pure HUTTON SEAM GAS COAL. Analysis of HOLMSIDE GAS COAL *in bulk as shipped* gives 10,500 cubic feet of Gas per ton, of an Illuminating Power of 16½ candles. The Sulphur is about 1 per cent., and the Ash 1¾ per cent. The Coal cokes well, and leaves 69 per cent. of excellent Coke. During the year 1890, the London Gas Companies carbonized about 400,000 tons of HOLMSIDE COALS. They are used by The Gaslight and Coke Company, the South Metropolitan Gas Company, the Woolwich (Government) Gas-Works, the Newcastle and Gateshead Gas Company, the European Gas Company, L'Union des Gaz, and by many other Gas Companies both at Home and Abroad.

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Strongly recommended where EXCESSIVE HEATS have to be maintained.

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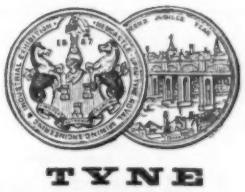

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Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

For Prices and complete Analysis, apply to

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HEBBURN MAIN GAS COALS.

Produce of Gas per ton - - - - - - - 10,500 feet.
" Coke " - - - - - - - 13½ cwt.
Illuminating Power - - - - - - - 16 candles.

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For Illustrated Description, see Advt. p. 861.

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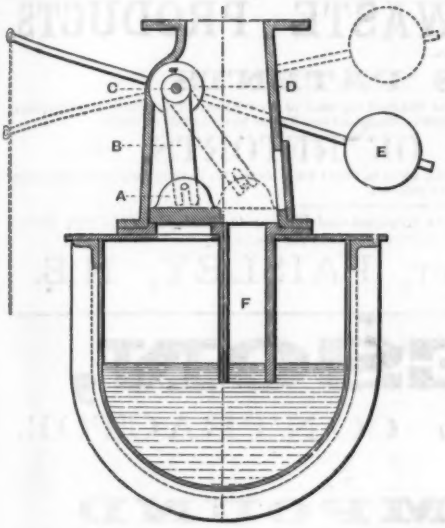

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Is cheap, and easily fixed to any form of main.
Will save more than their cost in one season's working.

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*** During the serious illness of **Mr. Neill Meiklejohn**, all communications as to the above should be addressed to **C. Meiklejohn, Gas Engineer, Oldbury, near Birmingham.**

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No more Gas spoilt by over-running the Exhauster.

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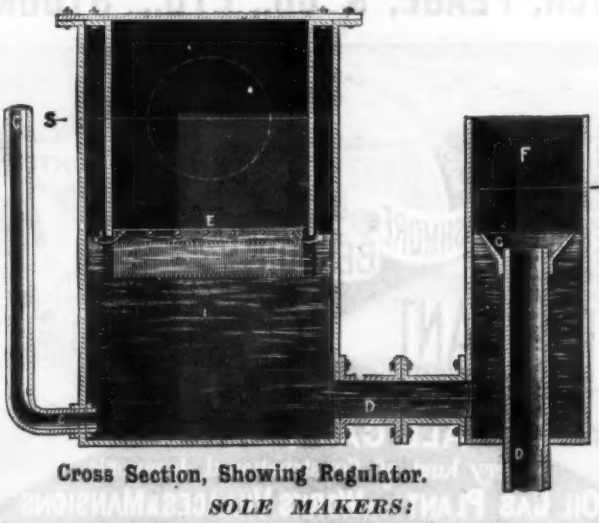

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Illustrated Pamphlet and Terms on application to J. E. FISHER, Stourbridge, Agent for England and Wales; to C. M. HAMILTON, Portland Place, Hamilton, Agent for Scotland and Ireland; and for all other Countries to the Patentee,

Geo. R. HISLOP, Gas Engineer, PAISLEY, N.B.

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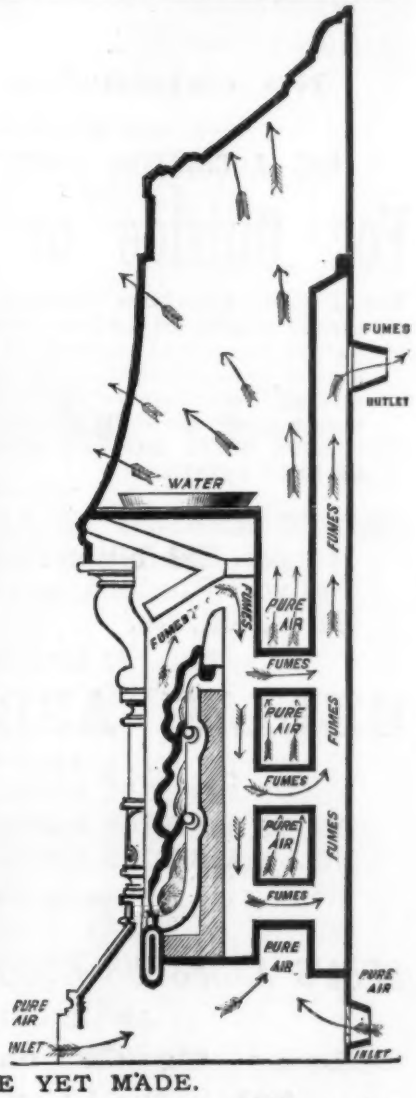

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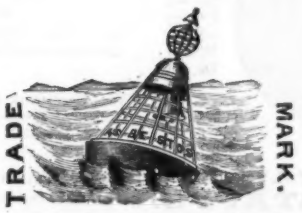

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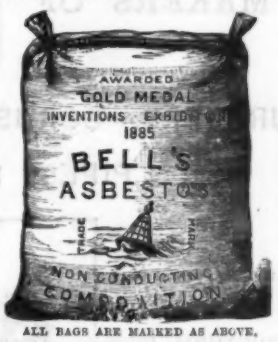

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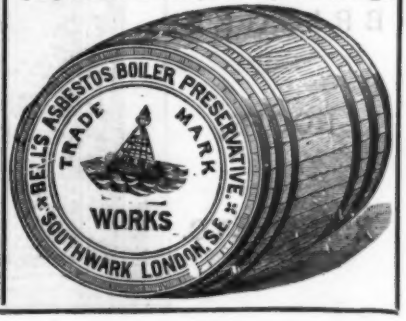

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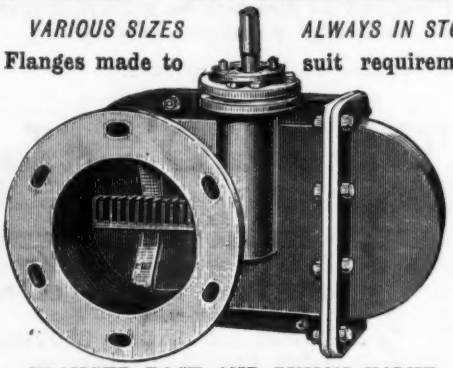

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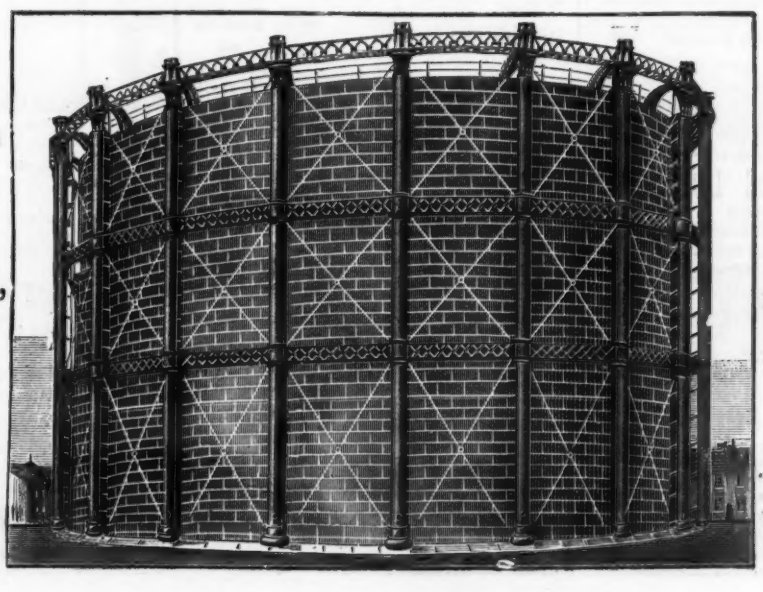

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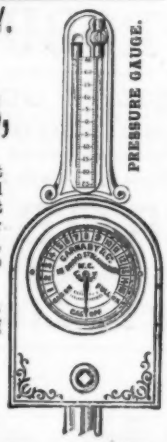

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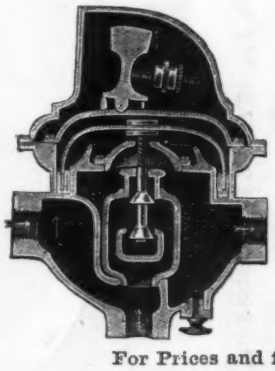

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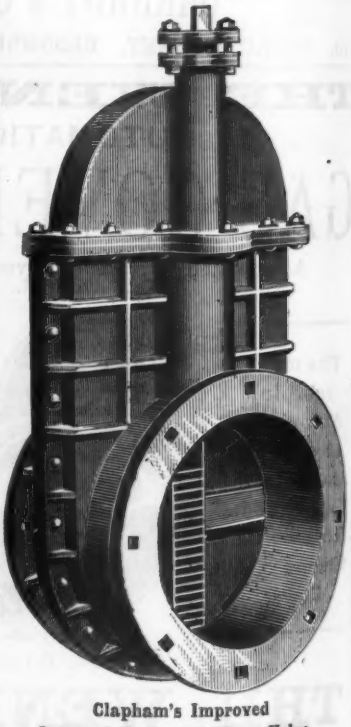
SILVER MEDAL, Inventions Exhibition, 1885.



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